Trent Watershed Survey

C. D. Howe and J. H. White

Commission of Conservation
Canada

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Commission of Conservation
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COMMITTEE ON FORESTS

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TRENT WATERSHED SURVEY

A RECONNAISSANCE

By

C. D. HOWE, Ph.D., AND J. H. WHITE, B.A., B.Sc.F.

With

AN INTRODUCTORY DISCUSSION

By

B. E. FERNOW, LL.D.

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and the Ex-officio Members of the Commission who represent the various provinces.

To Field Marshal His Royal Highness Prince Arthur William
Patrick Albert, Duke of Connaught and of Strathearn,
K.G., K.T., K.P., etc., etc., Governor-General of Canada.

May it Please Your Royal Highness :

The undersigned has the honour to lay before Your Royal Highness the attached report on the "Trent Watershed Survey," which was prepared for the Commission of Conservation by B. E. Fernow, LL.D., C. D. Howe, Ph.D., and J. H. White, B.A., B.Sc.F.

Respectfully submitted

CLIFFORD SIFTON
Chairman

Ottawa, August 9, 1913

OTTAWA, CANADA, August 7, 1913

Sir :

I beg to submit the attached report on the "Trent Watershed Survey," by B. E. Fernow, LL.D., C. D. Howe, Ph.D., and J. H. White, B.A., B.Sc.F. It contains the account of a reconnaissance carried on by Dr. C. D. Howe and Mr. J. H. White, prefaced with an introductory discussion of the subject by Dr. Fernow.

Respectfully submitted

JAMES WHITE
Assistant to Chairman

HON. CLIFFORD SIFTON
Chairman
Commission of Conservation
Ottawa

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FORMER PINERIES
These areas once supported sixty merchantable trees per acre. Now no seed trees remain to re-establish another pinery. 150,000 acres in this condition in the Trent Watershed

Trent Watershed Survey

I

Conditions in the Trent Watershed

Introduction

THE following report on the conditions of a section of a once rich forest area in Old Ontario, will serve to exhibit in a precise and detailed manner the consequences of mismanagement under the old system of timber licenses, consequences which afford a warning against a continuance of that system. The report is also intended to suggest possible methods of recovery. Furthermore, an area has been considered in which the conditions are typical of those in thousands of square miles of cut-over lands in the eastern provinces of Canada.

In the autumn of 1911, Mr. John H. Burnham, M.P., invited the writer to look over a portion of the watershed of the Trent canal, situated in Hastings, Peterborough, Haliburton and Victoria counties, Ontario, in company with the Superintendent of the Canal, with a view to formulating suggestions for taking care of the forest cover. It appeared that the Dominion Government had spent some ten million dollars on this canal and watershed, building dams at some 40 lakes to regulate the waterflow, although control of the watersheds, from which this flow derives its source, had not been secured by the government. The slopes, once, for the most part, covered with valuable pine and hardwood forest, had been cut over. A large area, the pinery in particular, had been repeatedly subjected to fires and rendered liable to eventual total destruction, especially since the commercial interest in the lands had to a large extent disappeared, through the removal of the merchantable pine timber.

A short inspection trip made it clear that these conditions presented a problem of peculiar and particular interest ; one of sufficient size and importance to call for careful analysis and consideration ; a problem meriting the development of some plan for its solution.

The proposition to make a detailed reconnaissance and description of the area as a basis for recommendations, appealed to the Chairman of the Commission of Conservation, the Honourable Mr. Sifton. As the timber had been nearly cut out, the Provincial Government was only receiving a trifling revenue from this portion of the country ; on the other hand, the interest of the Dominion, on account of the capital invested in the canal, was considerable. It was, therefore, decided to make a survey of the entire watershed north of the Kawartha lakes, or of at least as much as could be done in one season. By careful planning and diligent application, on the part of the field party, it was possible to accomplish the necessary field work for all of the watershed covered by this report, consisting of 2,100 square miles, during the summer of 1912, although the travel by foot in connection with the survey amounted to not less than 4200 miles.

The writer was charged with organizing the survey and laying out the plans of procedure. The party, consisting of Dr. C. D. Howe and Mr. J. H. White, both of the Faculty of Forestry, University of Toronto, and three student assistants, Messrs. Christie, McVickar and Watt, started in May, 1912, and, by the middle of September, the survey in the field was finished.

Reasons for the Survey

It may be desirable at the outset to enlarge somewhat on the reasons for selecting this particular area and to indicate what particular interest attaches to it. As stated, this area is illustrative of conditions prevailing over a very large territory of mismanaged lands, for which it is desirable to formulate a policy of reconstruction and recuperation. In addition to this, however, the fact that the waterway and waterpowers developed in the Trent canal draw their supply from this watershed lends more significance to this territory than to others.

Value of the Canal—The Trent Canal project has been a subject of public criticism and often of ridicule, ever since it was conceived, 85 years ago. The criticism and ridicule are not, however, deserved by the original project but only by the irrational, slow manner in which it was executed. The canal project, in fact, has been subjected to precisely the same kind of mismanagement as the territory through which it passes. The chief value of a canal lies in connecting markets and resources, and, therefore, depends mainly on its outlets. The first outlet of the canal, the one into lake Ontario, is now, after nearly a century of dilatory work, being completed ; the other, which affords access to Georgian bay, still hangs fire. So long as the outlets to larger markets or for through-traffic were lacking, only a very limited local traffic could develop. Since the canal does not pass through agricultural country, and, since the principal resource of the region it serves was timber—a staple which needs more than local markets for a profitable and rational development—the value of the incomplete canal was limited indeed. Since this outlet was unavailable, the timber, owing to the expense of transportation to market, was cut in a more or less wasteful manner. As a result, the government derived

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WATER STORAGE BASIN SURROUNDED BY AN OLD BURN

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ONE OF THE NUMEROUS UNDEVELOPED WATER-POWERS scarcely any profit from this industry, and the returns to the lumbermen were also relatively small. If the cheap transportation which a canal furnishes had been in existence earlier, much more conservative logging operations could have been carried on ; much closer utilization of material could have been made by mills situated along the route ; much more profit could have been secured from this resource by both operators and the people, and, moreover, the source could have been managed for perpetuity, as a basis for manufacturing industries. As it is, the principal local freight, that from the timber-lands, is almost exhausted, and a large part of the usefulness of the canal has gone, at least in so far as local development is concerned. Outside of the water-power which it supplies, through traffic, which may follow upon the completion of the two outlets, can alone justify its existence for the present ; unless by careful planning and management a revival of the industrial activity, to which, at one time, the lumberman gave rise, can be secured.

Forest and Waterflow—Meanwhile, another important factor in the problem, which is closely connected with the timber question, has been entirely lost sight of, namely, the securing of adequate water supplies for canal and power purposes by the conservation of a forest cover on the watersheds. Indeed, this factor, the conservation of water supplies, is one of paramount importance to the canal. Whatever may be said regarding the influence of deforestation on climate, an influence which, it must be admitted, is only imperfectly understood, there can be no question as to the *influence on waterflow which a forest cover exercises.* That such a cover prevents extremes of low-water and high-water stages, and generally regulates and equalizes waterflow, has been proved both by experience and experiment in all parts of the world.

The effect of this influence can be readily explained if it is assumed to act under extreme conditions. Consider a watershed with bare, rocky slopes. It is obvious that the water precipitation on it will run off as fast as it falls ; that the water stages in the river will be as erratic and fitful as the rainfall ; and that low-water and high-water stages will alternate in conjunction with dry and wet periods.

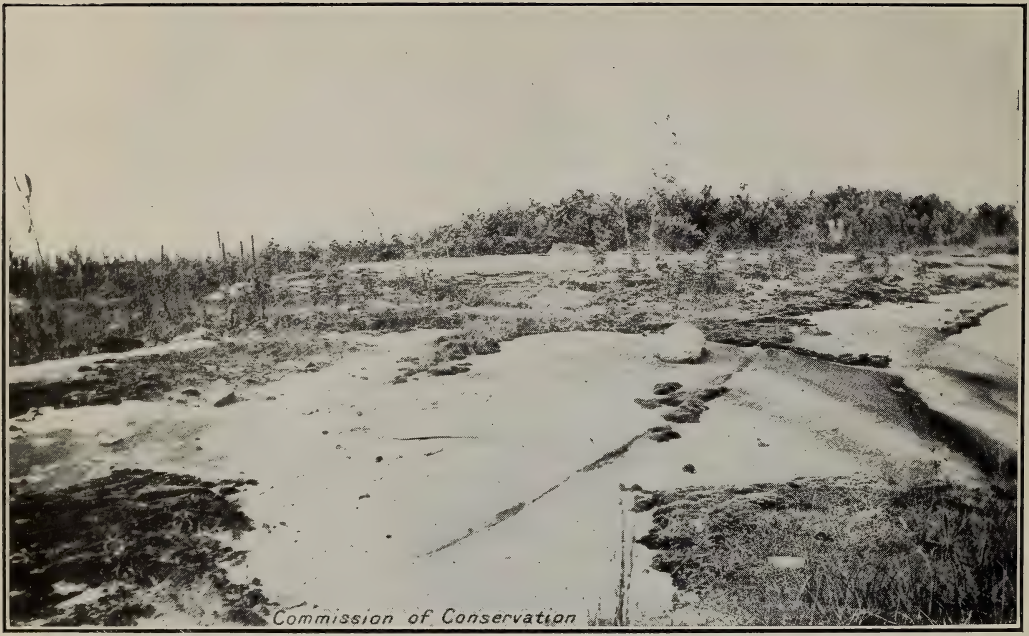
Now, consider the rock covered not only with soil and vegetation, but also with a dense forest growth, and then compare this condition of the watershed with the one previously mentioned. The rapid run-off is prevented by percolation ; the surface drainage is largely changed into subdrainage ; the river is to some extent fed by springs instead of surface flow ; the time during which the waters reach the river is lengthened ; and the flow becomes more even. Although in the case of unusual rains and precipitous slopes even the forest cover may not prevent floods ; yet they certainly will not be as frequent nor as severe as if the impediments to rapid surface drainage were absent. The soil, the litter, the moss and small vegetation, all contribute towards the formation of a water reservoir from which supplies gradually reach the river.

Between these assumed extremes of unfavourable and favourable conditions there exist all the intermediate conditions of surface cover, with corresponding efficiencies in changing surface drainage to subdrainage : the barren soil covering the rocky slope, the bare pasture of grass and weed growth, the ploughed field, the farm crop, the shrub growth and slash, the young forest growth, the old stand of timber, virgin or culled, and more or less dense,—these conditions in infinite variation, vary also in effectiveness as to control of run-off in the sequence given above.

There is one other influence of the forest cover, even of the poor stands, in regulating waterflow, which other vegetable cover or surface conditions only possess in a smaller degree. Water, as it runs over the slope, is apt either to dissolve soil particles or to carry them in suspension, thus eroding the soil, filling the river bed with sediment and decreasing the capacity of the channel. Even a grassy slope is not as efficiently protected against this erosion as a tree-clad one.

Engineers have sometimes thought that dams alone may effect the satisfactory regulation of the waterflow, but the wiser ones have recognized that, for the best service, dams need to be supplemented by a forest cover such as a watershed furnishes. Especially for city water supplies the practice of forestation of the watersheds has now been generally recognised as essential, mainly for the reason that erosion and the filling up of water reservoirs is thereby prevented. These explanations of the importance of the forest influence may perhaps serve to show the bearing of this survey on the Trent canal.

Causes of Deterioration—At the present time, the pine timber, at least, is practically gone from this watershed. A forest cover still exists, but, with the present commercial value almost entirely extracted, interest in its condition is gone ; fires have swept through it repeatedly, each time causing further deterioration of the forest cover, until, finally, the bare rock condition or man-made desert is the result. At present only beginnings of these conditions can be seen here and there, yet in the three townships of Methuen, Anstruther and Burleigh alone, nearly 150,000 acres of such desert exist. And, if the present policy of indifference and neglect continues, what might have been a continuous source of wealth will become not only a useless waste, but, through the changes which the water conditions will undergo, may also prove a menace to industries which have been developed to utilize the waterpowers of this watershed.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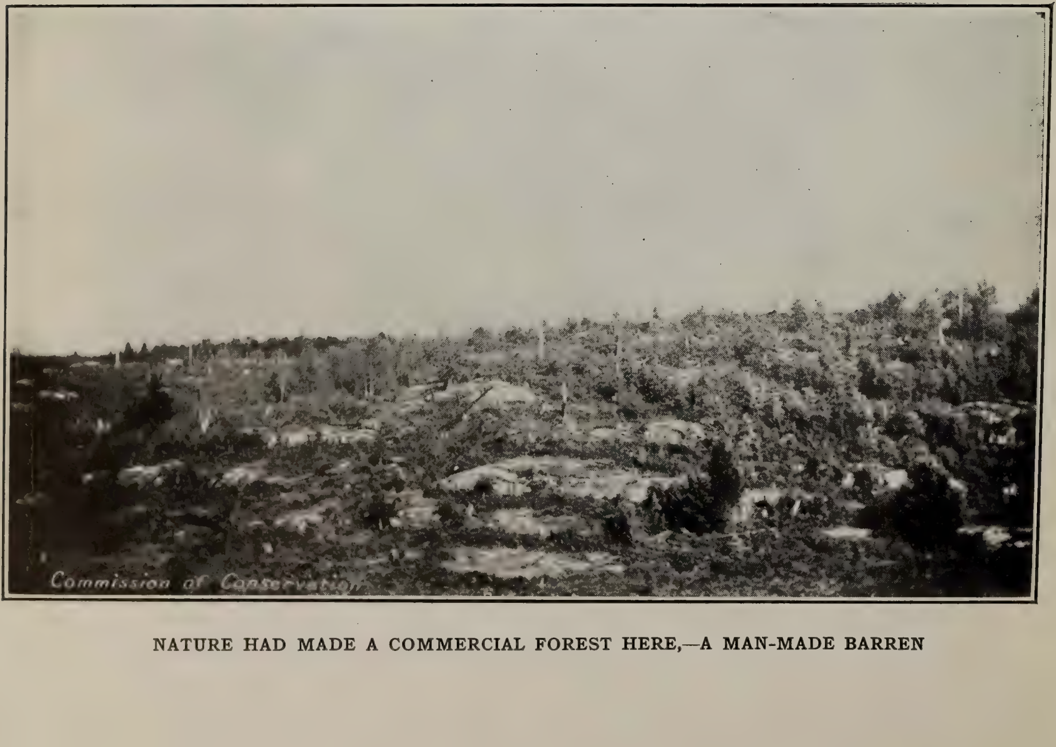
NATURE NEVER MADE A COMMERCIAL FOREST HERE,—A NATURAL BARREN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NATURE HAD MADE A COMMERCIAL FOREST HERE,—A MAN-MADE BARREN

The region under consideration lies on Archæan rock, planed by glacial action, and not easily disintegrated ; it is covered with only a thin soil which is easily washed into the streams, and, hence, the danger of turning it into an irredeemable waste is much more imminent than it would be in many other localities.

The effect of repeated fires, such as still occur quite generally, on the future of the forest cover can be studied in this region with considerable precision, and this has been done in a most painstaking manner by Dr. Howe. The financial aspect of this question of fire loss would alone justify this inquiry. If the reader will turn to page 60 and the following pages, where this aspect of the situation is discussed, he will be enabled to realize that this is more than an academic problem.

Here is a sample area of thousands of square miles in other parts of the Eastern provinces, and the conditions in this watershed are by no means extraordinary. They repeat themselves wherever axe and fire have been permitted to destroy the original growth in the Archæan rock country, that is to say, wherever lumbering under the license system has been permitted, without safeguarding the property as a producer. The sequence of this mismanagement is everywhere the same. The removal either of the best or of all timber, without disposing of the débris, leaves a slash which is invariably subject to fire ; after this, a loss of interest takes place on the part of the licensee and, what is still worse, on the part of the government. Nature then attempts to reproduce the forest and this is followed by a repetition of the fires, which kill the seed trees and seedlings of the better kinds. The ground is then re-covered by aspen and birch for a time ; but, through repeated conflagrations, it is finally rendered useless for any productive purpose. A similar sequence takes place in connection with the small-farm portions : at first, through the home market made by the lumbermen, a fair living may be made by the occupant ; gradually this market vanishes and the soil becomes worked out ; the surface wears away, the rocks are exposed, and the people are left destitute and miserable.

There is still another reason for the prosecution of the survey and that lies in the fact that a portion of the population of this region occupies farms unfit for sustaining civilized conditions. Not only have many farms been abandoned by the removal of their occupants to more hopeful conditions, but a considerable number that ought to be abandoned remain occupied by those who lack the means and energy to move, thus forming a poverty-stricken community. A far-reaching policy for the management of this region must include a plan for the removal of this *degenerating* population.

The problem presented by this region requires the formulation of a broad and far-reaching scheme of development and recuperation. The water-flow should be safe-guarded, and industries should be developed to utilize such small resources as are left, and to contribute freight to the canal, thus assuring a better future for this area than can be anticipated under the present policy of indifference and neglect.

Procedure of the Survey

Preliminary to going into the field a correspondence was carried on with the reeves and township clerks of the counties involved, in order to obtain their co-operation. Letters were also exchanged with the Dominion Forestry Branch and the Provincial Department of Lands, with a view to securing the data which they subsequently were kind enough to supply. Plans of the townships on a scale of one half mile to one inch were used in plotting the information.

The survey party started at Marmora, in the south-east corner of the portion of the watershed that was to be included in the survey, and camped through the country, moving camp every four or five days as the plotting of the information proceeded. The party usually divided, each member taking a section, travelling on foot over the townships, lot by lot, and securing by interviews with reeves, township clerks and other informed people, information of unvisited areas and of conditions not visible in the field, such as economic conditions, and from assessment rolls.

The general instructions for the party read as follows :

> "This survey is to furnish a detailed description of the economic and natural conditions and resources of the watershed in Peterborough, Hastings, Haliburton and Victoria counties feeding the Trent Canal waters, and to serve as a basis for a plan of management.
>
> The *economic conditions* to be ascertained are to comprise : (*a*) Ownership and status of timber limits ; (*b*) Municipal regulations and tax conditions ; (*c*) Farm development, crops, character and quantities ; (*d*) Manufactures and mills in existence, and possibilities of industrial development locally ; (*e*) Means of transportation and development of water-powers, so far as useful for developing local industries ; (*f*) Tourist traffic, game and fishing interests.
>
> The *natural conditions* to be ascertained and, so far as possible, to be mapped, are : (*a*) Topography (in the rough) and segregation of watersheds ; (*b*) Land classification by parcels, down to 10 acres lowest limit ; (*c*) Statements regarding character of climate and soil ; (*d*) Character and conditions of forest growth in connection with (*b*), including estimates of merchantable timber

standing, and of young growth; (*e*) Fire damage; (*f*) Reproduction and rate of growth studies."

Dr. Howe paid special attention to the study of fire damage and reproduction, and has treated the physiographic side of the inquiry, while Mr. White undertook more particularly the investigation into the economic conditions.

History of the Region

The Trent Canal route is the old canoe route which the Indians were already using when Champlain, in 1615, travelled over it. The history of the canal itself and of its gradual development can be traced from the reports of the Department of Public Works* and, later, of the Department of Railways and Canals of the Dominion.† Until 1905, the Provincial Government also exercised control over the waters, having built dams and timber slides, to assist logging operations, and, also, a few locks, as at Youngs Point, to assist local navigation.

The first suggestion to connect lake Ontario and Georgian bay was made in 1827, and, in 1833, an act was passed by the legislature of Upper Canada appointing commissioners to receive plans and to execute the works necessary for the improvement of the inland waters of the Newcastle district. In the same year the first survey was made and the cost of the construction of the works was estimated at $933,789. The survey of the second portion of the route was made in 1835, and the estimated cost of the work was $1,048,271, making the estimate for the total work $1,982,000.

In 1836, a loan of $64,000 for the Trent River works was authorized by Act of Parliament and in 1837 a further loan of $310,030 was authorized, to be applied to the inland division. On the commencement of the works in that year the Receiver-General set aside the sum of $136,266 to be applied to the works on the Trent river.

Previous to the union of the provinces in 1841 the progress of the work had been slow, and in fact had been often stopped altogether, owing, it appears, to the limited advances made by the Receiver-General to the commissioners. The total expenditure prior to this time had amounted to $177,592.

In the 'forties,' after the union of the provinces, the through route idea was abandoned, but local development of the waters for logging purposes went on, until, in 1855, the cost of maintenance of the slides, booms and other works being greater than the revenue resulting from them, they were handed over to a corporation—the "Trent Slide Committee"—which was to keep them in repair by means of tolls on the timber floated. Between the years 1841 and 1867 the amount expended by the Committee amounted to $492,486, but something over $47,000 of this was spent on roads and bridges so that the outlay on the waterway for that period may be put at $445,269. This amount, together with the $177,592 expended prior to 1841, makes a total expenditure of $622,861 up to the year 1867.

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*Department of Public Works Reports, 1867 (which relates the earlier history), and 1882.

†Department of Railways and Canals Reports, 1885, 1888, 1890, 1892, 1897, 1906, 1909.

During the early 'sixties' a great movement to secure the timber limits on this watershed took place, and, by 1865, about 1000 square miles, the pine area, had been alienated, mostly without or with only a nominal bonus paid to the provincial government, which also built locks and dams here and there, to aid the lumber industry. In 1870, a flood destroyed many of these works, which were then, in part, abandoned.

Some feeble attempts were made by some of the lumbermen to revive the canal project, but they were unsuccessful, although by 1872 there were twenty lumber firms in operation and producing considerably over 100 million feet of pine lumber. However, the water stored by the dams that had been constructed continued to be available for logging purposes.

Further progress in canal building was made in the years 1883-88, but not until 1896 was the "driblet" policy abandoned and the proposition taken up seriously, with yearly appropriations of several hundred thousand dollars, which in 1909-10 were increased to a million, in 1911 to $1,750,000, and in 1912 to $1,938,136.48.

In the Canal Superintendent's report for 1892 we find the first recognition of the need of water control for the canal. He writes : "Owing to the immense country drained becoming cleared, and to the fact that the lumbermen's dams, which formerly checked the flow, are being abandoned, there is a liability, until some provision is made to counteract it, of the heavy spring freshets damaging the several structures along the route. Need of control of the upper reservoirs becomes every year a more serious question to those interested in navigation and water-power." This need was not supplied, nor was this incongruity of control removed until 1905, when by Order in Council the province ceded all the works in the back lakes and the water surfaces of all rivers, streams and lakes, tributary to the Trent river north of Peterborough, excepting the Crow River basin, to the Dominion Government, and also agreed to sell to the Dominion unpatented lands along the water surfaces at 50 cents per acre. Two thousand acres have, so far, been acquired by the Dominion under this provision.

The principal headwaters of the system are, however, situated on private lands in the central part of Haliburton county, more especially in the townships of Sherborne, Havelock, Eyre, Stanhope, Guilford, Harburn, Minden, Dysart and Dudley. These headwaters consist of a series of connected lakes of not less than 130,000 acres of water surface, which is not under control of the Dominion. The feeders to the canal, under the control of the Dominion, lie in nine different basins, comprising over 100,000 acres of water surface. These nine basins are, the Gull river and the Burnt river , the two largest, and, in sequence of their size, the Mississagua, Jack creek, Eels creek, Deer Bay creek, Nogie creek, Buckhorn creek, and Squaw river. Exclusive of lakes Simcoe and Couchiching (with 283 square miles of water surface), the total water area of the canal and its feeders covers nearly 300 square miles.

When the Dominion took over these watercourses it immediately repaired the old wooden dams or replaced them by concrete structures, organized a systematic management of the waterflow, and, as a result, doubled the waterflow at Peterborough and at other power-houses without interfering with, but rather improving, the operations of the lumbermen.

Meanwhile, the lumber industry has dwindled to one-tenth of its size in 1872, the pine cut in 1911 being less than 18 million feet, out of a total cut of approximately 42 million feet B.M. of lumber. By the time the last pine log is cut, which will be probably within five years, or thereabout, the cheap transportation which would have made a conservative forest policy possible will be just established.

The first part of the problem is how to develop and foster small industries along the more than 160 miles of completed waterway, in order to make the most of the horse-power available,* and of the remaining wood supplies ; the second part concerns the building up of the timber production in order to provide future local traffic on the canal, as well as to conserve the waterflow for the development of water-powers along its line, and for the maintenance of a sufficient supply of water in the canal after its completion.

The agricultural settlement of most of the region was a concomitant or consequence of the lumber industry, and in many, if not most cases, was dependent for its financial success entirely on that industry. Owing to its geological history, the country very rarely exhibits really agricultural soils. As Dr. Coleman in a memorandum on the geology of the region states, "The combination of kames (hills of sand and gravel with boulders) with pure sand deposits, through which rise occasional hills of the harder Archæan rocks, makes a region entirely unsuited for agriculture, and useful only for forest growth. The result of glacial action north of the Palæozoic rocks has been the formation of poor soils deficient in lime and often also in clayey constituents, except for the occasional lime-stone or shale and clay deposits."

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*More than 100,000 H.P.

While the lumber industry was thriving and a home market existed, the farmer on these poor soils could produce and sell enough potatoes, oats, hay, and meat products, to make a fair living. With the extinction of this market, however, the trouble began, and at present abandoned farms—abandoned by the more enterprising young men of a new generation—and run-down farms and farmers, too poor and too lacking in enterprise to move, testify to the mistaken policy of allowing irresponsible settlement on non-agricultural soils. Conservation of human life and energy, conservation of decency in population, conservation of soils for useful production, alike call for a readjustment of this undesirable state of affairs.

That these statements are not overdrawn is shown by the farm statistics and is corroborated by the testimony of the people living in the area reported on.*

Results of the Survey

Preliminary to the formulation of recommendations, a summary of the findings of Messrs. Howe and White, as detailed in their reports, was drawn up. A table gives a classification of the whole area in 18 classes.† Since the seven northern townships are, for the most part, still covered with a virgin or semi-virgin forest, they have been enumerated separately, and the discussion refers, therefore, mainly to the 1,171,614 acres in the lower watershed. Here, 83.5 per cent is still forest-covered, but only 700 acres are virgin forest, and less than 90,000 acres have been moderately culled ; the rest have been severely culled and are, therefore, in unmerchantable condition. Nearly 60,000 acres are waste lands, the result of fires. Some 580,000 acres are covered with young and second-growth trees ; less than 12 per cent, 134,000 acres, are farmed. A table compiled from assessors' returns is added for comparison and to give an idea of values.‡ Discrepancies in details of area from the survey are explained in part by either inclusion or exclusion of areas in the two lists, in part by difference of method in statement. On the whole, however, the results coincide fairly in so far as percentages are concerned.

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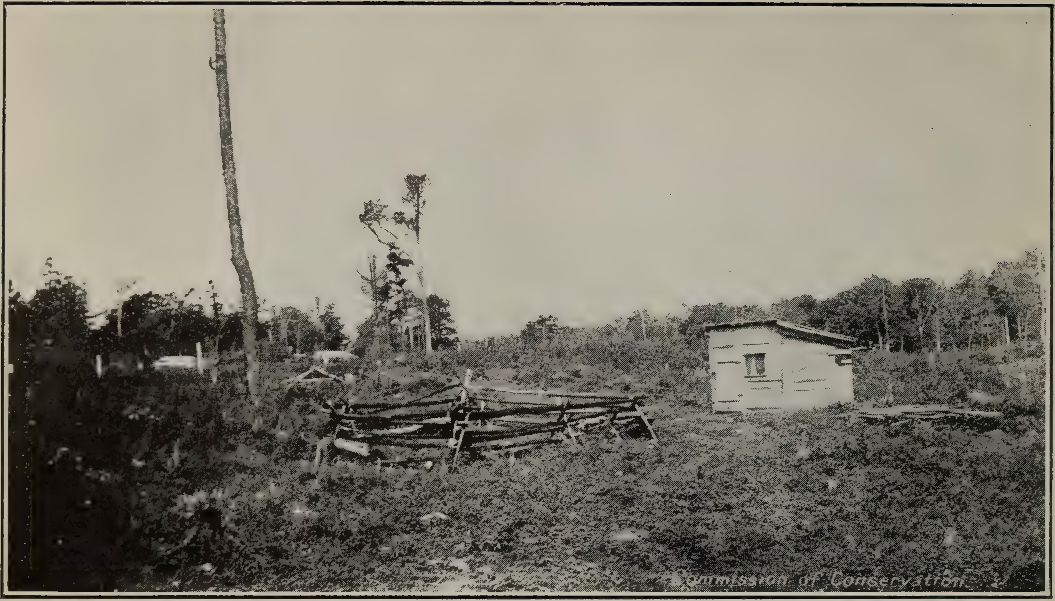
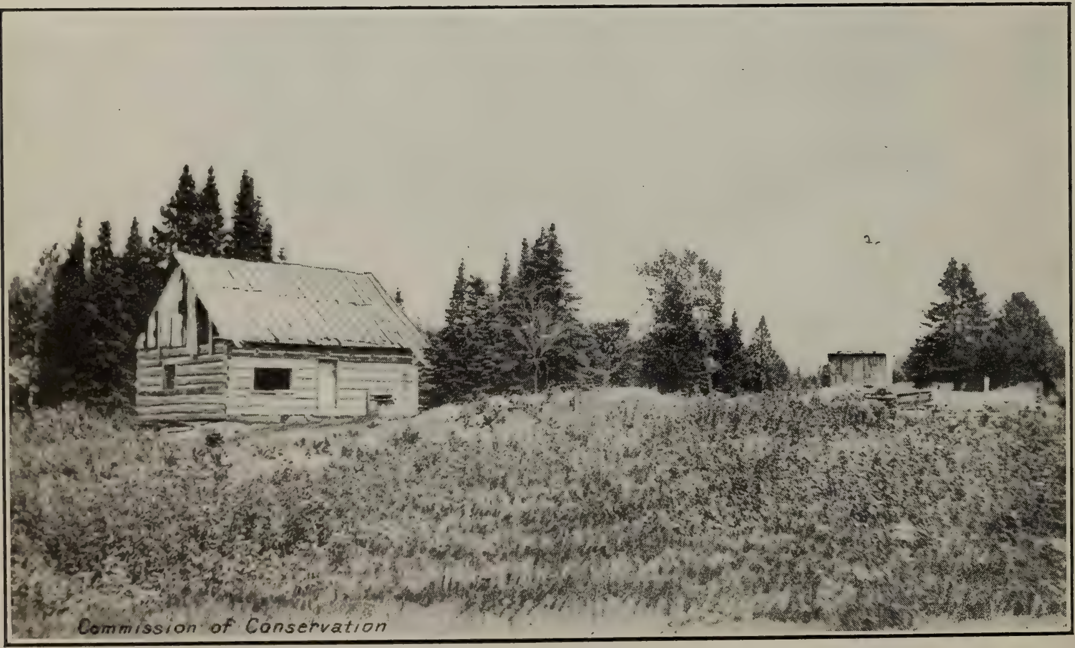
* See p. 95 and Appendix v, p. 120.
† See pp. 21-28.
‡ See p. 29.


Commission of Conservation

THE BEGINNING
With the exception of patches containing a few square feet, there is, on this prospective farm, no soil that approaches a loam in texture. It is mostly gravel and sand


Commission of Conservation

THE END
One of the many abandoned farms in the Trent Watershed. The amount of human energy expended in attempting to make a living from such areas has been, and still is, enormous

Farming Conditions—The fact that, half a century after the opening of this region to settlement, its 2,100 square miles contain less than 15,000 people, and that hardly 10 per cent of the area of all the 35 townships included in the survey has been cleared for farm purposes, would indicate that it is not suitable for agriculture. Indeed, if the five best townships, so far as farm land is concerned, Chandos, Marmora, Minden, Somerville, and Wollaston, are omitted, the remainder averages little more than 8 per cent of cleared land, and only about 1.5 per cent is tilled land, the other 6.5 per cent being found in the shape of more or less fair pasture land. Further evidence of the misfortunes which come from farming rocks or the shallow glacial drift covering them, is furnished by the abandoned farms which are found through the whole region in large numbers, and which are sold from time to time for non-payment of taxes at less than 6 cents per acre on the average.* In consequence, during the last decade, the decrease of the population has been 15 per cent, as against 5 per cent decrease of rural population in the whole province. This is, of course, a desirable solution of the problem, for it is to be expected that those who left are elsewhere doing better than merely eking out a precarious existence; the land which they left, being fit for nothing else but forest growth, gradually reforests itself.

There is, of course, the excuse that the results could not be foreseen; that the province needed the revenues from the timber limits; and that the settlement on these farms at the time when the lumbermen's business was thriving was a natural result. The further excuse may be made that, at the time in question, employment in the lumber camps provided an additional source of income for the support of these people. Even though this be true, it does not alter the fact that the time for correction of the policy is now at hand. Here is a native population, the welfare of which should be of more concern than that of new immigrants. Here is a natural resource to be recuperated for the sole purpose for which it is adapted.

Forest Conditions—The original forest on the lower watersheds was to the extent of fully two-thirds, a magnificent pinery, or in part hardwood with white pine admixture; the other third was a pure hardwood forest, of which maple and beech formed 75 to 85 per cent, and hemlock 2.5 per cent. Now, the white pine is all but removed, and, with the exception of 700 acres still virgin, the whole lower watershed is more or less severely culled. The pinery has been burnt over at least once and in most places several times.

***194 of these farms were for sale in 1911.**

This statement, as intimated before, leaves out of consideration the holdings of the Canada Land and Immigration Company in the northern headwaters. This is a hill country quite different in character from the lower watersheds, being still largely covered by a virgin forest of hardwood, either pure or mixed with spruce, pine and hemlock. This region has been only partly culled, and little or not at all damaged by fire.

The forest cover of the lower watershed, a round one million acres, can be divided into four types, in addition to the barren country—3.2 per cent—which was originally forest-covered, and that recently burned over, nearly 2 per cent (22,000 acres), which may, or may not, recuperate. The types of mature timber are pure hardwood, pure conifer growth, and mixed hardwood and conifer, these being types of the original forest. The fourth type is the result of forest fires; it is the original pinery, now occupied by a young growth of poplar and birch, pure or with more or less young pine intermixed.

Less than 90,000 acres of mature timber remain in a condition which can be called "moderately culled ;"* somewhat over 300,000 acres have been severely culled† ; some 20,000 acres are immature timber of the original type ; and the balance, some 560,000 acres, is of the poplar-birch type. This latter type represents not only the largest area, 57.3 per cent of the whole forest and 42.2 per cent of the whole area, but is also the most important and most valuable for the future, as it furnishes an opportunity for reproducing the pinery, which once represented the chief asset of this territory. According to the severity and frequency of the fires, more or less of pine regeneration is found interspersed with the poplar and birch.

The whole area has been burned over at least once. Including the 37,000 acres which originally belonged to this type and are already turned into barrens or semi-barrens, and 22,500 acres of recent burns which will change into this type, we have 620,000 acres of these burned areas, one-quarter of which has been so often burned that neither seed trees nor young pine growth exist on it ; these 156,000 acres are therefore unable to recuperate by natural processes. Nearly two-thirds of the area (389,000 acres) have been burned over two or three times and are practically also beyond natural recuperation, with only six young pines, on the average, to the acre. Only 75,000 acres, burned once, promise, if fire is kept out, to recuperate naturally, with 30 young pine and seed trees—as compared with 60 to 80 in the original stand—left to the acre.

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* *i.e.* still containing sawlogs of commercial value.

† *i.e.* with no commercial timber and fit only for cordwood.

Occasionally, conditions are much better than this average would indicate. In Cashel township, for instance, was found an area burned over once, the fire disposing of the loggers' débris. On this area 280 trees of white and red pine were counted per acre, which would be quite a satisfactory reproduction. Another stand in Cashel which escaped fires after the first one of 75 years ago, and which, therefore, may be called 70 years old, indicates what might result from protection. Here, 360 trees to the acre were found, of which 280 were white and red pine, averaging 6.7 inches in diameter (1 inch in 10.4 years), which may be estimated at 12,000 feet B.M. (175 feet per year). In spite of such good showings, the average of 500 acres of sample areas distributed over the entire area and carefully investigated by Dr. Howe, gives the low figures just cited as averages.

By means of these countings, it has, for the first time, been possible to attempt, on a definite basis, and in a convincing manner, an approximate estimation of the fire loss by the destruction of the young growth. With the most modest assumption of values, Dr. Howe comes to the conclusion that, on this area of less than 1,000 square miles, over 12 million dollars worth of prospective stumpage dues and stumpage values have been lost to the province, or $20 per acre. There seems tc be no reason to doubt that twice that amount would be nearer the truth, and, indeed, in many cases, the whole producing capital has been destroyed. Not less than 37,000 acres are reported as being barren, owing to fires, and 150,000 acres as showing no reproduction of pine or seed trees. As this is only a small sample area of the thousands of square miles of similar country, in similar condition, in other parts of the province, a realization may be had of the enormous losses that have resulted from lack of protection of young growth.

Since, in the Trent watershed, on the average, 14,000 acres are burned yearly, the annual loss by forest fires may be placed at $250,000. For detail of such calculations Dr. Howe's report furnishes ample data. Yet, in these same pineries, through natural processes of recuperation, there are still prospective values of not less than $8,000,000 left in young pine and poplar, which it is certainly worth while to save by more efficient protection against fire.

It should be realized that the capital value of this 1,000,000 acres of forest property, based on its productive capacity, would, under proper management, represent not less than $50,000,000, and the solution of the problem of securing such management would appear to be worth while.

Ownership Conditions—It appears that the bulk of the land is privately owned, the provincial government retaining title to only one-third, or 725 square miles. The important fact which the 'Ownership' map reveals is that these government holdings are largely situated in a compact block with only few outlying parcels, a condition which renders a conservative policy practicable. That the farming country lies mainly on the outskirts of this forest country is also a favorable factor. It is also significant that another 340 square miles is owned by large corporations, one of these holding a compact block of 171,000 acres, the other 67,000 acres. Such large ownerships make conservative management at least possible. The Dominion government owns, as previously stated, some 2,000 acres, which, however, represents merely locations for dams, buildings, and other easements.

Of the provincial property, a little over one-third (275 square miles) represents limits which have reverted to the Crown, after the licenses had lapsed or been abandoned. The other 450 square miles are still under licenses, which, since the pine has practically all been cut, are, however, apt to run out or could, probably, be easily terminated.

Industrial Development—From the description of the forest conditions, it is evident that the hey-day of the lumber industry is passed ; a few years will see the end of it, at least in so far as pine is concerned. At the present time the aggregate cut of some ten lumbering concerns is at the rate of about 10 million feet B.M. a year.

Hardwood logging is but little developed ; the fact that the old timber is very defective requires that, to be profitable, it must be manufactured near the source of supply and utilized most closely. The establishment of small woodenware manufactures is most desirable. Tindle and Jackson, an American firm of wide experience in this line of manufacture, have lately acquired some 40 square miles in Glamorgan, Monmouth, Cavendish, and Anstruther townships. They propose to establish a plant near Gooderham, and to work these limits. Similar development over the whole hardwood area should be encouraged.

Small amounts of pulpwood, of cedar poles and posts, cooperage stock, railroad ties, tanbark, and fuelwood are being shipped. Since the one at Fenelon Falls was destroyed by fire, only one wood-alcohol plant is in operation in the northern portion of the watershed, viz., the Donald Wood Products Company—a plant of thoroughly modern construction.

The Mining Industry—Appendix IV* contains notes regarding the mineral industry. They have been summarized from the report on the Haliburton and Bancroft areas by Dr. F. D. Adams and Dr. A. E. Barlow. Gold, iron, iron pyrites, talc, marble, and rock for road metal form the mineral resources so far discovered and, in a small way, developed. Lately, the Cordova gold mine under new management, has taken on new life. Similarly iron mining, which collapsed owing to inability to compete with the iron ore production of the Lake Superior and Minnesota ranges, promises to revive, the Central Ontario Railway Company having centralized the various small operations in a concentrating plant at Trenton. Altogether, while nothing phenomenal has been so far developed in mining and quarrying, there are materials in the district which, by careful management, may be expected to support small industries.

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* See p. 115.

Tourist Traffic—On account of its scenic attractions and the fish and game which abound there, this region is eminently suited for tourist travel. Thus far, this is considerably developed only on the Kawartha lakes, but the region abounds in lakes, which, eventually, will also be utilized in this way. This resource, as well as the timber and water resources, has suffered from the forest fires, which have rendered unattractive many previously beautiful spots.

The region is by no means inaccessible, the Grand Trunk, Central Ontario, and Irondale, Bancroft and Ottawa railways, furnishing access; and existing canoe routes could be easily improved right up to the headwaters.

Recommendations

Nobody who has studied the conditions presented in this report will hesitate a moment in agreeing that the bulk of the country involved should be placed in, and managed as, a permanent forest reserve for the growing of timber. The only question can be : How this is to be brought about ? There are at least five interests to be considered or reckoned with and to be brought into co-operation in building up such a territory—the Dominion Government, the Provincial Government, the municipalities in which the territory is situated, the private owners of properties and of timber licenses, and the public at large.

Besides the general interest which the governments naturally have in the economic condition and development of any portion of the commonwealth, the Dominion Government, as pointed out, has a special interest in maintaining the canal. The Provincial Government still controls about one-third of the area, partly under timber licenses, partly in cancelled or abandoned lots. The municipalities are naturally most closely interested in seeing as much of their land as possible put to profitable use, in order to reduce the individual tax assessments and, at the same time, to permit of a higher degree of civilization through increased industrial activities and educational facilities.

Private landholders will be benefited by better protection. Their property will increase in value owing to the improved environment, particularly if a continuous improvement of conditions is assured in place of the present tendency towards deterioration. With management for perpetuity, instead of exploitation for a short time, permanent manufactures can be established, industrial development will increase, and the public at large will gain in prosperity.

Co-operation of all these agencies will be necessary to carry through any far-sighted, persistent policy. The co-operation of the three administrative agencies, the Dominion, Provincial and Municipal governments, is especially needed to develop anything like a permanent forest policy, for forest growth is slow, and financial results from timber growing, the only incentive for private enterprise, are slow in coming, so that only persistent entities like governments can be expected to carry on the business of timber growing. The policy, then, should be to bring all the lands which are not strictly farm lands as rapidly as possible under the control of one, or any, of these three agencies. These lands should be combined into one or more forest reserves, and a forest administration should be provided for.

Municipal Ownership—The most natural owners of such forest reserves are undoubtedly the municipalities as representatives of the people who are on the ground, and who, therefore, should take the greatest interest in its condition. One of the counties has already recognized the propriety of getting possession of these cut-over lands. The county of Hastings, under the leadership of Reeve P. P. Clark of Limerick township, organized a Forest Committee in 1911, with this end in view. It secured legislation from the Provincial Parliament permitting municipalities to acquire such lands and to expend funds in purchase of such to a limit of $25,000. In pursuance of this legislation the County has acquired 2,200 acres in the township of Grimsthorpe, outside of the Trent watershed, paying therefor the accrued taxes at the rate of about 17 cents per acre. At the instance of the writer, and, as a result of his address to the County Council of Peterborough, a similar committee to look into the matter of municipal ownership of cut-over lands was appointed in that county last summer.

Since this legislation marks a new and important phase of the forestry movement, the Act (I Geo. V. Chap. 74, 1911) is below, printed in full.

> "His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario enacts as follows :
>
> 1. This Act may be cited as "*The Counties Reforestation Act.*"
>
> 2. The Municipal Council of a county may pass by-laws :—
>
> (*a*) For acquiring by purchase, lease or otherwise, such lands designated in the by-law as the council may deem suitable for reforestation purposes ;
>
> (*b*) For planting land so acquired and for preserving and protecting the timber thereon ;
>
> (*c*) For the management of such lands and the sale or other disposal of the timber grown thereon ;
>
> (*d*) For the issuing of debentures from time to time for the purpose of providing for the purchase of such lands to an amount not exceeding $25,000 to be owing at any one time.
>
> 3. No by-law shall be finally passed under this Act until the same shall have been approved in writing by the Minister of Agriculture.
>
> 4. (*a*) Municipal Councils of townships in districts without county organization shall have all the powers, privileges and authority conferred by paragraphs (*a*), (*b*), and (*c*) of section 2 hereof, on councils of counties.
>
> (*b*) The councils of such townships shall have power and authority to levy by special rate a sum not exceeding $200 in any year for the purpose of providing for the purchase of such lands."

While this legislation is undoubtedly of the right kind, it would seem that, on account of financial inability, these provisions by themselves are not apt to promise a rapid development of municipal ownership. In order to overcome this difficulty, it has been suggested that, if the Province sees in municipal ownership a solution of the problem, it should hand over to the counties, free of cost, limits on which licenses have lapsed, under conditions which would tend to assure the results looked for.

While we may readily agree that such municipal ownership increases the interest of the resident population in the property, and hence, especially in its protection against fire, which is the foremost need, yet there are some practical arguments, which are mainly financial, against this policy. The need of control by the Dominion, for the regulation of water supplies, may also, in part, clash with such a plan.

While, under municipal ownership it might be easier than under Provincial or Dominion ownership, to utilize profitably the small values that even a mismanaged wood-lot can often still yield, large areas of these lands not only contain no values of any kind, but, to become useful at all, require expenditure for planting ; others to yield better and quicker results require expenditure in thinning. These constitute present expenditures for the sake of future returns. Technical advice as to these procedures is also required, and this would also entail expenditure. It may be pointed out in passing that a first-class forest manager is only fully occupied when the planning for and management of a tract of 50,000 to 100,000 acres and more is involved, hence it is doubtful whether a municipality could employ a competent man fully. The size of the property influences the financial success of the management also in other ways, namely, when the gain from the good acres can be used to recuperate the poor acres. This is, in part, the secret of the financial and managerial success of the German forest administrations. Moreover, a successful forestry business requires a long continued and persistent plan, which, with the shifting conditions of municipal administration, is not very likely to be followed. Even in Germany, the success of municipal forest administration—and it is a thorough success—is secured only by a more or less strict State supervision. The best results from a financial point of view in municipal forests, are secured in Baden, where the State manages the municipal forest properties for a stated sum per acre paid by the municipality. Altogether, the financial ability and especially the patience of the municipality in waiting for returns, will be taxed, if a real management of these properties for sustained yield is to be inaugurated.

Government Ownership.—It is here that the co-operation of the financially strong government, with its superior credit and organization, is needed. If, as appears probable from the appointment of a provincial forester, the provincial government assumes its responsibility for the future of the timber resources of the province, this region offers a most promising first field for action. A plan should be drawn up for recovering licensed lands and for dividing them into units to facilitate management, some to be managed by the province and some by the municipalities. The plan should allow for the provision of technical advice for their management, and for the furnishing of such financial assistance as may be necessary through a municipal and state bonding scheme. The rights of supervision and participation in eventual returns should be retained by the province. Some such plan of co-operation should obviously be elaborated ; the province selecting for transfer to the municipality such tracts as entail merely protection, and undertaking the management of the more complicated tracts as its own reserves.

The first step for the Province to take would appear to be to repossess itself of the licensed lands which have practically ceased to produce the quantity of logs contemplated under the original licenses. The next thing would be to impose upon the timber limit holders, who have still some valuable timber left, such conditions as would prevent the jeopardizing and the destruction of the property itself.

If the Province assumes the responsibility of such a conservative forest policy, the Dominion might well be relieved of participation in it, for its interests would then be subserved. If, however, it is not the intention of the Province to efficiently protect, recuperate, and manage these forest areas, the Dominion should, by control of the watersheds, be placed in a position to protect its water rights.

As pointed out, an efficient forest management, especially of cut-over lands, can be satisfactorily carried on only if compact properties of sufficient size are placed under one management. It is a great advantage that such conditions are found here, namely, compact areas of land in the hands of the Province, which could be placed in one reserve under one manager. The man in charge of such property must be a real and circumspect manager, continuously active on the ground. His first duty would be to make a careful survey and map of the property, showing conditions in detail, at the same time, organizing an effective service for protection against fire, building watch-towers, and, where roads or ready means of travel do not exist, he should provide trails, gradually perfecting the protective service. Next, he must make it his business to encourage the establishment of small woodworking manufactures that can utilize the mature hardwood timber, as well as the minor forest products now going to waste. The small values that can be secured by an efficient local manager so far as possible, must be made to pay the cost of recuperation. He must also encourage private enterprise to develop the tourist travel and foster the fish and game resources as a not unimportant asset of the forest reserve. Then follows the improvement of existing stands and of natural regeneration by thinnings, the proceeds of which should, together with the profits of such logging of mature timber as may still be done, pay for the operation.

Next comes the question of planting to improve or make productive the partly or wholly waste lands. This is a task worthy of strenuous effort on the part of an efficient man, properly supported by either the Provincial or Dominion Government. Is it not time to begin such actual practical forest management instead of merely talking of conserving our forest resources, theorizing on their value, and letting them go to ruin ? The field for reform is, to be sure, so wide, that the reformers are staggered by the problem of where to begin ; but here is a concrete case with which a beginning could be made, a case presenting a definite situation and a definite problem. If begun not half-heartedly and in the picayune manner in which such things are usually undertaken, but with a full realization that only a thorough-going business administration on a large enough scale promises success, the result cannot fail to prove satisfactory.

As to financial outcome we can quite reasonably figure that a 500,000 acre reserve, half the present forest area, managed in the manner indicated, even in the poor condition in which it is found, could almost from the beginning pay for its maintenance by the sale of odds and ends of available timber at the rate of 5 cents per acre, or $25,000 per year. Within a decade, when the first 750,000 cords of poplar pulpwood become available this would yield, if cut off in 25 years, at least $100,000 per year, or 20 cents net revenue per acre, from this source alone. By the time this is exhausted and replaced by a young pine stand, further pulpwood areas and some pine would have become ready for the axe, wood values would have increased, and an annual income of not less than $2 per acre from a sustained wood yield may be assured forever. This would be less than one-third of the net revenue derived from a forest property of approximately the same size in Germany, the State Forest of Württemberg—not an unreasonable expectation!

The natural reproduction on the areas that are kept free from fires is found unusually favourable ; it would therefore not be too sanguine to expect eventually an annual increment of 100,000 M. feet of saw timber besides other materials ; that means an annual business in growing, harvesting, transporting, and manufacturing of not less than $5,000,000 to $6,000,000.

A special problem is that of the poor population. With such a development as would come from the management of the forest reserves, there would be occupation for a number as guards and labourers in the reserves, and some of the better farm locations within the reserves might be of advantage in keeping these on the ground. But the greater portion needs to be re-located on more suitable lands, and, as far as could be ascertained, they would be most willing to accept assistance from the government to secure new locations, say in the Northern Ontario Clay Belt. It is important that this matter be made a subject of special inquiry.

In conclusion, I would point out that this survey and report with these suggestions as to procedure, is to be taken only as a basis for further inquiry and planning, a clearing of the decks as it were, and that the Commission of Conservation should follow up this work by formulating in more detail plans of co-operation and by bringing them to an issue.*

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* At present writing, following up this suggestion, the Commission has put Dr. Howe in the field to secure further information, especially as to reproduction and rate of growth, as a basis for further financial discussion.

TRENT WATERSHED FOREST SURVEY, 1912

CLASSIFICATION OF LANDS—SOUTHERN TOWNSHIPS

	ANSON		ANSTRUTHER		BURLEIGH		CARDIFF		CASHEL	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*1,987*	*12.6*	*2,325*	*3.5*	*3,110*	*4.7*	*3,650*	*7.0*	*1,280*	*6.6*
II. Forest :										
1. Hardwood :										
Virgin and moderately culled	.....	....	2,701	....	.....	....	211	....	3,784	....
Severely culled	3,608	....	10,995	....	5,232	....	12,185	....	1,353	....
Second growth	.....	....	.....	....	.....	....	768	....	.....	....
Young growth	.....	....	266	....	43	....	82	....	74	....
	3,608	*22.9*	*13,962*	*20.7*	*5,275*	*7.9*	*13,246*	*25.4*	*5,211*	*26.8*
2. Mixed :										
Virgin and moderately culled	.....	....	.....	....	.....	....	610	....	.....	....
Severely culled	238	....	4,651	....	886	....	1,650	....	384	....
Second growth	.....	....	93	....	.....	....	.....	....	.....	....
Young growth	.....	....	.....	....	27	....	.....	....	.....	....
	238	*1.5*	*4,744*	*7.0*	*913*	*1.4*	*2,260*	*4.3*	*384*	*2.0*
3. Coniferous :										
Virgin and moderately culled	.....	....	5,206	....	.....	....	.....	....	.....	....
Severely culled	18	....	5,376	....	600	....	3,449	....	693	....
Second growth	.....	....	.....	....	.....	....	.....	....	16	....
Young growth	.....	....	152	....	.....	....	.....	....	.....	....
	18	*0.1*	*10,734*	*15.9*	*600*	*0.9*	*3,449*	*6.6*	*709*	*3.7*
4. Poplar type :										
1 to 15 years	626	....	5,931	....	1,491	....	2,789	....	4,737	....
15 to 30 years	9,264	....	28,459	....	46,915	....	26,756	....	7,089	....
30 to 50 years	.....	....	248	....	.....	....	.....	....	.....	....
	9,890	*62.8*	*34,638*	*51.4*	*48,406*	*72.6*	*29,545*	*56.6*	*11,826*	*60.9*
III. Recently burned	.....	....	989	1.5	6,347	9.5	72	0.1	.....	....
IV. Barrens	.....	....	.....	....	1,971	3.0	.....	....	.....	....
Land area investigated	*15,741*	....	*67,392*	....	*66,622*	....	*52,222*	....	*19,410*	....

TRENT WATERSHED FOREST SURVEY, 1912

CLASSIFICATION OF LANDS—SOUTHERN TOWNSHIPS—*Continued*

	CAVENDISH		CHANDOS		DYSART		FARADAY		GALWAY	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*661*	*1.4*	*9,349*	*18.2*	*4,438*	*11.4*	*3,685*	*12.5*	*8,013*	*12.4*
II. Forest :										
1. Hardwood :										
Virgin and moderately culled	6,242	....	2,662	....	418	....	870	....	907	....
Severely culled	14,795	....	15,971	....	21,662	....	9,509	....	10,294	....
Second growth	.....	....	.....	....	152	....	.....	....	.....	....
Young growth	.....	....	258	....	24	....	.....	....	26	....
	21,037	*44.3*	*13,891*	*36.6*	*22,256*	*57.1*	*10,379*	*35.1*	*11,227*	*17.3*
2. Mixed :										
Virgin and moderately culled	.....	....	730	....	.....	....	.....	....	462	....
Severely culled	787	....	,430	....	1,213	....	734	....	2,419	....
Second growth	.....	....	267	....	42	....	.....	....	.....	....
Young growth	.....	....	277	....	49	....	.....	....	.....	....
	787	*1.7*	*5,704*	*11.1*	*1,304*	*3.4*	*734*	*2.5*	*2,881*	*4.4*
3. Coniferous :										
Virgin and moderately culled	2,400	....	352	....	.....	....	.....	....	542	....
Severely culled	1,056	....	550	....	653	....	2,043	....	2,973	....
Second growth	.....	....	.....	....	.....	....	.....	....	4,282	....
Young growth	.....	....	120	....	53	....	.....	....	136	....
	3,456	*7.3*	*1,022*	*2.0*	*706*	*1.8*	*2,043*	*6.9*	*7,933*	*12.2*
4. Poplar type :										
1 to 15 years	1,440	....	344	....	1,837	....	8,278	....	.....	....
15 to 30 years	18,054	....	15,770	....	7,746	....	2,054	....	34,528	....
30 to 50 years	.....	....	408	....	.....	....	.....	....	.....	....
	19,494	*41.1*	*16,522*	*32.1*	*9,583*	*24.6*	*10,332*	*34.9*	*34,528*	*52.2*
III. Recently burned	1,768	3.7	.....	....	664	1.7	2,388	8.1	272	0.4
IV. Barrens	229	0.5	.....	....	.....	....	.....	....	.....	....
Land area investigated	*47,432*	....	*51,488*	....	*38,951*	....	*29,561*	....	*64,854*	....

CLASSIFICATION OF LANDS—SOUTHERN TOWNSHIPS—*Continued*

	GLAMORGAN		HARVEY		HERSCHEL		HINDON		LAKE	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*3,918*	*7.9*	*12,322*	*14.0*	*173*	*13.2*	*266*	*5.1*	*1,258*	*2.0*
II. Forest :										
1. Hardwood :										
Virgin and moderately culled	.....	....	534	....	.....	....	.....	....	29,761	....
Severely culled	10,319	....	17,810	....	598	....	1,680	..	5,589	....
Second growth	.....	....	458	....	.....	....	.....	....	.....	....
Young growth	.....	....	510	....	.....	....	.....	....	640	....
	10,319	*20.7*	*19,312*	*22.0*	*598*	*45.9*	*1,680*	*32.4*	*35,990*	*56.4*
2. Mixed :										
Virgin and moderately culled	.....	....	45	....	.....	....	.....	....	677	....
Severely culled	558	....	1,179	.....	19	....	.....	....	243	....
Second growth	.....	....	160	....	.....	....	.....	....	.....	....
Young growth	.....	....	110	....	.....	....	.....	....	.....	....
	558	*1.1*	*1,494*	*1.7*	*19*	*1.5*	.....	....	*920*	*1.4*
3. Coniferous :										
Virgin and moderately culled	.....	....	.....	....	.....	....	.....	....	.....	....
Severely culled	234	....	1,230	....	.....	....	.....	....	259	....
Second growth	.....	....	.....	....	.....	....	.....	....	.....	....
Young growth	.....	....	24	....	.....	....	.....	....	.....	....
	234	*0.5*	*1,254*	*1.4*	.....	....	.....	....	*259*	*0.4*
4. Poplar type :...										
1 to 15 years	1,491	....	8,294	....	.....	....	30	....	944	....
15 to 30 years	32,685	....	35,976	....	514	....	3,214	....	23,698	....
30 to 50 years	.....	....	312	....	.....	....	.....	....	.....	....
	34,176	*68.5*	*44,582*	*50.8*	*514*	*39.4*	*3,244*	*62.5*	*24,642*	*38.6*
III. Recently burned	654	1.3	1,246	1.4	.....	....	.....	....	736	1.2
IV. Barrens	.....	....	7,570	8.6	.....	....	.....	....	.....	....
Land area investigated	*49,859*	....	*87,780*	....	*1,304*	....	*5,190*	....	*63,805*	....

TRENT WATERSHED FOREST SURVEY, 1912

CLASSIFICATION OF LANDS—SOUTHERN TOWNSHIPS—*Continued*

	LIMERICK		LUTTERWORTH		MARMORA		METHUEN		MINDEN	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*4,712*	*12.1*	*3,929*	*10.4*	*10,042*	*26.2*	*1,683*	*2.7*	*12,854*	*31.5*
II. Forest :										
1. Hardwood :										
Virgin and moderately culled	2,234	....	80	....	26	....	1,766	....	2,549	....
Severely culled	5,176	....	3,640	....	13,390	....	6,250	....	14,963	....
Second growth	170	....	.....	....	379	....	35	....	488	....
Young growth	1,001	....	.....	....	4,586	....	48	....	128	....
	8,581	*22.1*	*3,720*	*9.9*	*18,381*	*48.0*	*8,099*	*12.8*	*18,128*	*44.4*
2. Mixed :										
Virgin and moderately culled	48	....	.....	....	.....	....	56	....	.....	....
Severely culled	2,547	....	570	....	4,485	....	51	....	1,611	....
Second growth	16	....	.....	....	82	....	.....	....	90	....
Young growth	490	....	.....	....	62	....	.....	....	32	....
	3,101	*8.0*	*570*	*1.5*	*4,629*	*12.1*	*107*	*0.2*	*1,733*	*4.3*
3. Coniferous :										
Virgin and moderately culled	.....	....	.....	....	.....	....	.....	....	.....	....
Severely culled	996	....	22	....	27	....	.....	....	386	....
Second growth	.....	....	.....	....	48	....	.....	....	.....	....
Young growth	29	....	35	....	.....	....	.....	....	264	....
	1,025	*2.6*	*57*	*0.1*	*75*	*0.2*	.....	....	*650*	*1.6*
4. Poplar type :										
1 to 15 years	4,014	....	.....	....	1,803	....	1,154	....	841	....
15 to 30 years	13,688	....	29,299	....	3,305	....	24,741	....	6,093	....
30 to 50 years	.....	....	59	....	36	....	.....	....	472	....
	17,702	*45.5*	*29,358*	*78.0*	*5,164*	*13.4*	*25,895*	*41.0*	*7,406*	*18.1*
III. Recently burned	3,762	9.7	13	.03	56	0.1	.....	....	46	0.1
IV. Barrens	.....	....	.....	....	.....	....	27,368	43.3	.....	....
Land area investigated	*38,883*	....	*37,647*	....	*38,347*	....	*63,152*	....	*40,817*	....

TRENT WATERSHED FOREST SURVEY, 1912

CLASSIFICATION OF LANDS—SOUTHERN TOWNSHIPS—*Continued*

	MONMOUTH		RIDOUT		SHERBORNE		SNOWDON		SOMERVILLE	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*4,782*	*8.9*	.....	....	.....	....	*6,229*	*12.4*	*18,553*	*27.3*
II. Forest :										
1. Hardwood :										
Virgin and moderately culled	.....	....	184	....	307	....	.....	....	.....	....
Severely culled	25,286	....	83	....	13	....	1,499	....	2,811	....
Second growth	213	....	.....	....	.....	....	24	....	.....	....
Young growth	32	....	.....	....	.....	....	30	....	157	....
	25,531	*47.7*	*267*	*67.6*	*320*	*2.2*	*1,553*	*3.1*	*2,968*	*4.4*
2. Mixed :										
Virgin and moderately culled	256	....	.....	....	8,428	....	.....	....	.....	....
Severely culled	727	....	.....	....	1,949	....	1,163	....	2,901	....
Second growth	.....	....	.....	....	.....	....	.....	....	...	....
Young growth	.....	....	.....	....	.....	....	.....	....	560	....
	983	*1.9*	.....	....	*10,377*	*72.5*	*1,163*	*2.3*	*3,461*	*5.1*
3. Coniferous :										
Virgin and moderately culled	.....	....	.....	....	.....	....	.....	....	.....	....
Severely culled	590	....	14	....	.....	....	306	....	526	....
Second growth	.....	....	.....	....	.....	....	.....	....	.....	....
Young growth	.....	....	.....	....	.....	....	.....	....	398	....
	590	*1.1*	*14*	*3.6*	.....	....	*306*	*0.6*	*924*	*1.3*
4. Poplar type :										
1 to 15 years	6,166	....	.....	....	.....	....	27	....	282	....
15 to 30 years	14,370	....	114	....	3,624	....	40,824	....	40,800	....
30 to 50 years	13	....	.....	....	.....	....	.....	....	856	....
	20,549	*38.4*	*114*	*28.8*	*3,624*	*25.3*	*40,851*	*81.5*	*41,938*	*61.7*
III. Recently burned	1,070	2.0	.....	....	.....	....	.....	....	.....	....
IV. Barrens	.....	....	.....	....	.....	....	.....	....	128	0.2
Land area investigated	*53,505*	....	*395*	....	*14,321*	....	*50,102*	....	*67,972*	....

TRENT WATERSHED FOREST SURVEY, 1912

Classification of Lands—Southern Townships—*Continued*

	Stanhope		Tudor		Wollaston		Totals		
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	
I. Cleared land	*4,509*	*12.1*	*2,755*	*12.3*	*7,243*	*16.1*	*133,726*	*11.4*	
II. Forest :							978,307		83.5
1. Hardwood :									
Virgin and moderately culled	546	....	798	....	5,803	....	62,383	....	
Severely culled	10,563	....	2,122	....	13,160	....	240,556	....	
Second growth	.....	....	.....	....	.....	....	2,687	....	
Young growth	.....	....	282	....	275	....	8,462	....	
	11,109	*29.8*	*3,202*	*14.3*	*19,238*	*42.6*	*314,088*	*26.8*	(32.1)
2. Mixed :									
Virgin and moderately culled	851	....	.....	....	829	....	12,992	....	
Severely culled	5,576	....	917	....	1,522	....	43,410	....	
Second growth	.....	....	107	....	.....	....	857	....	
Young growth	14	....	512	....	214	....	2,347	....	
	6,441	*17.3*	*1,536*	*6.8*	*2,565*	*5.7*	*59,606*	*5.1*	(6.1)
3. Coniferous :									
Virgin and moderately culled	3,678	....	.....	....	.....	....	12,178	....	
Severely culled	309	....	226	....	3,818	....	26,354	....	
Second growth	.....	....	.....	.....	.....	....	4,346	....	
Young growth	.....	....	54	....	.....	....	1,265	....	
	3,987	*10.7*	*280*	*1.2*	*3,818*	*8.5*	*44,143*	*3.8*	(4.5)
4. Poplar type :									
1 to 15 years	1,654	....	2,296	....	1,766	....	58,235	....	
15 to 30 years	8,334	....	12,145	....	9,699	....	499,758	....	
30 to 50 years	53	....	.....	....	.....	....	2,477	....	
	10,041	*26.9*	*14,441*	*64.3*	*11,465*	*25.4*	*560,470*	*47.8*	(57.3)
III. Recently burned	1,204	3.2	239	1.1	789	1.7	22,315	1.9	
IV. Barrens	.....	....	.....	....	.....	....	37,266	3.2	
Land area investigated	*37,291*	....	*22,453*	....	*45,118*	....	*1,171,614*	....	

Percentage figures in parentheses denote the participation of each forest type in the total forest area.

NOTE—The above classification refers to conditions in 1912. In 1913 some 175,000 acres were burned over, changing the classification within the area indicated on the Forest Distribution map (in pocket) and map showing fires in 1913 (see page 32).

TRENT WATERSHED SURVEY, 1912

CLASSIFICATION OF LANDS—NORTHERN TOWNSHIPS—Semi-Virgin

	BRUTON		DUDLEY		EYRE		GUILFORD	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	.....	....	*381*	*1.0*	.....	....	*2,307*	*6.0*
II. Forest :								
1. Hardwood :								
Virgin and moderately culled	.....	....	23,526	....	1,198	....	20,549	....
Severely culled	.....	....	9,799	....	.....	....	3,249	....
	.....	....	*33,325*	*89.7*	*1,198*	*4.4*	*23,798*	*62.0*
2. Mixed :								
Virgin and moderately culled	.....	....	.....	....	.....	....	1,144	....
Severely culled	.....	....	1,619	....	.....	....	314	
	.....	....	*1,619*	*4.4*	.....	....	*1,458*	*3.8*
3. Coniferous :								
Virgin and moderately culled	4,043	....	.....	....	25,110	....	8,818	....
Severely culled	.....	....	.....	....	.....	....	59	....
Young growth	.....	....	.....	....	1,133	....	.....	....
	4,043	*100.0*	.....	....	*26,243*	*95.6*	*8,877*	*23.1*
4. Poplar type :								
15 to 30 years	.....	....	1,787	....	.....	....	1,768	....
30 to 50 years	.....	....	24	....	.....	....	.....	....
	.....	....	*1,811*	*4.9*	.....	....	*1,768*	*4.6*
III. Recently burned	.....	....	.....	....	.....	.....	149	0.4
Land area investigated	*4,043*	....	*37,136*	....	*27,441*	....	*38,357*	....

TRENT WATERSHED SURVEY, 1912

Classification of Lands—Northern Townships—Semi-Virgin—*Continued*

	Harburn		Harcourt		Havelock		Totals	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
I. Cleared land	*330*	*1.0*	....	....	....	....	*3,018*	*1.73*
II. Forest :							170,914	98.27
1. Hardwood :								
Virgin and moderately culled	18,064	....	....	....	....	....	63,337	....
Severely culled	1,990	....	2,362	....	....	....	17,400	....
	20,054	*58.1*	*2,362*	*61.8*	....	....	*80,737*	*46.4*
2. Mixed :								
Virgin and moderately culled	4,125	....	....	....	....	....	5,269	....
Severely culled	.....	....	....	....	....	....	1,933	....
	4,125	*12.0*	....	....	....	....	*7,202*	*4.19*
3. Coniferous :								
Virgin and moderately culled	9,781	....	....	....	28,661	....	76,413	....
Severely culled	.....	....	....	....	....	....	59	....
Young growth	.....	....	....	....	....	....	1,133	....
	9,781	*28.4*	....	....	*28,661*	*100.0*	*77,605*	*44.6*
4. Poplar type :								
15 to 30 years	180	....	1,462	....	....	....	5,197	....
30 to 50 years	.....	....	....	....	....	....	24	....
	180	*0.5*	*1,462*	*38.2*	....	....	*5,221*	*3.0*
III. Recently burned	.....	....	....	....	....	....	149	.08
Land area investigated	*34,470*	....	*3,824*	....	*28,661*	....	*173,932*	....

A somewhat incomplete compilation of assessors' returns gives the following picture of conditions, the discrepancies in areas, as explained, being due to inclusions of outlying sections not included in the Trent watershed. It appears that the total assessment averages only $2.30 per acre.

TRENT WATERSHED SURVEY, 1912
(ASSESSORS' RETURNS)

—	Cleared Land	Woodland	Slash	Swamp, Marsh and Waste Land	Acreage Assessed	Assessed Value of Land.	Assessed Value of Buildings	Total Assessment	Population
	Acres	Acres	Acres	Acres	Acres				
Anson and Hindon	2,912	8,213	1,983	469	13,577	$	$	$	228
Anstruther and Burleigh	4,020	16,395	5,758	6,074	32,247	72,645	31,545	104,190	570
Belmont and Methuen	16,771	8,088	24,515	27,192	76,566	152,398	66,911	218,654	1,585
Bruton	260	38,944	140	......	39,344	59,660	300	59,960	3
Cardiff	4,341	7,483	4,353	3,014	19,191	50,286	6,795	57,081	537
Cashel and Tudor	8,675	14,768	17,083	20,471	60,997	73,752	33,375	107,127	678
Cavendish and Galway	10,000	26,000	12,570	14,200	62,770	.....	.....	52,780	...
Chandos	7.616	17,500	7,152	10,805	43,073	64,616	18,155	82,441	687
Clyde	.....	46,849	.....	......	48,649	70,270	.....	70,270	...
Dudley	380	36,982	503	......	37,865	76,360	1,200	77,560	36
Dysart	3,437	33,069	4,241	......	40,747	110,280	85,110	195,390	830
Eyre	......	48.306	.....	......	48,306	72,450	....	72,450	....
Faraday	5,759	37,117	1,720	5,688	50,284	63,895	20,500	84,395	729
Glamorgan	2,703	5,716	6,191	7,972	22,582	26,468	6,219	32,687	447
Guilford	....	.....	.....	......	......	74,985	7,305	82,290	249
Harburn	407	36,996	340	......	37,743	76,380	1,395	77,775	63
Harcourt	352	30,450	179	......	30,981	50,035	2,545	52,580	61
Harvey	13,756	14,084	39,157	126	67,123	176,957	3,572	205,552	854
Havelock	.....	42,219	.....	......	42,219	63,325	.....	63,325	....
Limerick	4,327	27,528	6,321	6,943	45,119	58,855	8,425	63,390	392
Lutterworth	3,034	6,432	.....	14,788	24,254	.....	.....	......	316
Marmora and Lake	17,685	19,874	40,643	32,094	110,296	.....	.....	......	1 ,506
Minden	9,911	12,234	5,006	10,354	37,505	53,826	31,980	85,806	857
Monmouth	5,074	7,964	8,751	7,853	29,642	65,298	18,385	83,683	651
Snowdon	5,695	2,373	14,173	11,047	33,288	55,485	10,265	65,750	693
Somerville	16,656	1,663	44,687	1,356	64,362	170,445	76,120	246,940	1,698
Stanhope	3,312	7,198	4,775	3,838	19,123	30,873	12,787	30,873	483
Wollaston	6,424	11,022	7,929	73,175	48,550	103,393	37,980	134,823	815
Totals	153,307	565,467	258,170	257,459	1,186,403	$1,872,937	$480,869	$2,407,772	15,068
Per cent	12.4	45.8	20.9	20.8					

A few examples as to values and assessments, and other information furnished by County Clerks, will give an additional idea of conditions. In Belmont and Methuen 50,086 acres are estimated as waste land, and 8,088 acres as timber land; the latter is assessed at an average of $3.50 approximately, some of it as low as 50 cents, and its true market value is supposed to be $5 ; the waste land is considered still worth $2, and is assessed at from 50 cents to $1.00 ; the taxes being 12 mills on one-third to one-half the supposed market value.

In Harvey township the timber land is stated to be 23 per cent (much less than in the survey) and 50 per cent as waste and cut-over land, which must include, of course, much of the poplar area. The farm area, stated as 15 to 20 per cent (14% in the survey) is supposed to be worth $20, a high value relatively, but is assessed at about $10.80 in the average; the timber land, worth $5 to $30, is assessed at from $2 to $12, in the average $6, and the waste or cut-over lands at their full value of $1 to $5 ; the rate here being 20 mills. Here a flourishing lumber industry exists, four companies still operating and some of them have a superior fire-ranging system, the Jackson and Tindle Company employing a system of watchmen clocks to control the ranger.

In Glamorgan, one of the poorest townships, with a population of 447 people, 33⅓ per cent is assessed as timber land and 40 per cent as waste, the latter remaining untaxed, while the former, supposed to be worth $10, is assessed at from $1 to $3, the value of the timber being hardly considered, while the farm land is assessed at $1 to $5 per acre, the average being $4, supposed to be its true value ; the rate of taxation is 19½ mills. At least 10 per cent of the land in farms is entirely unfit for that use. The total returns per farm are about $200, mostly derived from cattle, and there is but little chance for outside earnings, except by cutting pulpwood, which sells at $3.75 per cord, and other wood in small quantities. Much of the pulpwood is sent to Pennsylvania. The lumbering of pine was finished in 1903. Lumbermen encouraged location of lots by settlers in order to escape government dues under the license system. No tourist traffic or summer hotel business exists, although the township abounds in lakes and is very accessible by rail.

In Haliburton county, the 9 townships mostly in possession of the Canada Land and Immigration Company, include 250,000 acres of timber land (partly outside the watershed) and are assessed at $2 while the true value is supposed to be $10 per acre ; the 75,000 acres of waste and cut-over lands are assessed at half their value, which is stated as $2.00—half for the land, half for the timber—while the 35,000 acres of farm land are assessed at full value, namely $5 ; the rate being 10½ mills.

ADDENDA

This report and the foregoing tabulation of forest conditions were compiled in 1912. Extensive forest fires during the summer of 1913 have altered the conditions on about 175,000 acres. Dr. Howe has made an investigation of the extent and origin of these fires and estimates the actual and prospective loss at not less than $3,000,000.

Dr. Howe's report is as follows :

It is stated in the body of this report, on page 63, that 620,000 acres of cut-over pine lands in the Trent watershed had been burned in the past 30 to 40 years, and of this area nearly 390,000 acres had been burned two and three times: 156,000 acres, four to eight times, while only 75,000, or one-eighth of the whole, had escaped with only one burning. An idea of what these repeated fires have cost the Province in terms of potential dues and stumpage values may be obtained by referring to the table on page 63. It was shown that these burned-over lands contained enough poplar and young pine to justify an attempt on the part of the proper authorities to save them from further destruction by fire. At the present time, for reasons stated on pages 64 and 65, *they are entirely without fire protection.*

The necessity of effective protective measures has been forcibly prescribed by the widespread and destructive fires of last summer. The fires of last July and August burned over approximately 175,000 acres in the region considered by this report. This represents over 15 per cent. of the forested area within the Trent watershed and 31 per cent of the area classed as former pineries. The extent and distribution of these burns are indicated on the accompanying map*, as well as in the table below. The four largest areas are grouped to represent continuous burns.

AREAS BURNED IN 1913

Township	*Acres*	*Total*
Anstruther	36,480	
Burleigh	19,560	
Cavendish	15,740	
Glamorgan	3,360	
Harvey	1,830	
Monmouth	800	
		77,780
Methuen	29,600	
Lake	14,500	
Burleigh	1,000	
Wollaston	500	
		45,600
Glamorgan	15,480	
Snowdon	12,700	
Dysart	500	
		28,680
Lutterworth	9,000	
Anson	5,680	
		14,680

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* See page 32.

Township	*Acres*	*Total*
Limerick	7,500	
Tudor	1,500	
Cardiff	1,200	
Harvey	1,000	
Guilford	500	
Stanhope	250	
Eyre	150	
		12,100
		178,840

(At least 175,000 acres of the total given above are in the former pine lands.)

The fire in Anson and Lutterworth had its origin outside the region considered by this report, where it burned over much larger areas. The Tudor fire also burned a much larger area outside the territory upon which this report is based.

The burning of the areas given above was due to 16 separate fires. The origin of 4 of these fires is reported as unknown ; 4 as having been set with malicious intent ; 3 from farmers working in hay marshes ; 2 from a railway engine ; 1 from the camp fire of tourists ; 1 from berry pickers ; and 1 from lightning. *Ten of these 16 fires started on crown lands not patrolled by a fire ranger.** Two of the six fires occurring on patrolled lands are reported as having been set deliberately. The destruction on the three largest areas, namely, the Anstruther-Burleigh-Cavendish area, the Glamorgan-Snowdon area and the Lake-Methuen area, totalling 148,420 acres, or 84 per cent of the entire area burned, was the result of 5 fires, and *three of these started on crown lands where there was no actual fire patrol.* The other two fires started in patrolled timber limits in a region where one ranger is charged with the surveillance of about 100 square miles.

In regions not suffering from forest fires there is a tendency to minimize the damage they cause. One often hears the expression : "No particular damage was done, as the fire ran through cut-over lands." It is well to consider how little comprehension of the facts of the case such statements involve. For example, we may make the following charges to the account of the recent forest fires in the Trent valley.

EXPENDITURES IN FIGHTING FOREST FIRES

Peterborough Lumber Co	$2,500
Wood Products Co. of Canada	350
Gull River Lumber Co	250
Minden village, 100 days' labour	200
Farmers in Anson and Lutterworth, 75 days' labour	150
Farmers in Glamorgan and Snowdon, 180 days' labour	360
Farmers in Anstruther, Burleigh, and Cavendish, 200 days' labour	400
Farmers in Lake and Methuen, 50 days' labour	100
Total	$4,310

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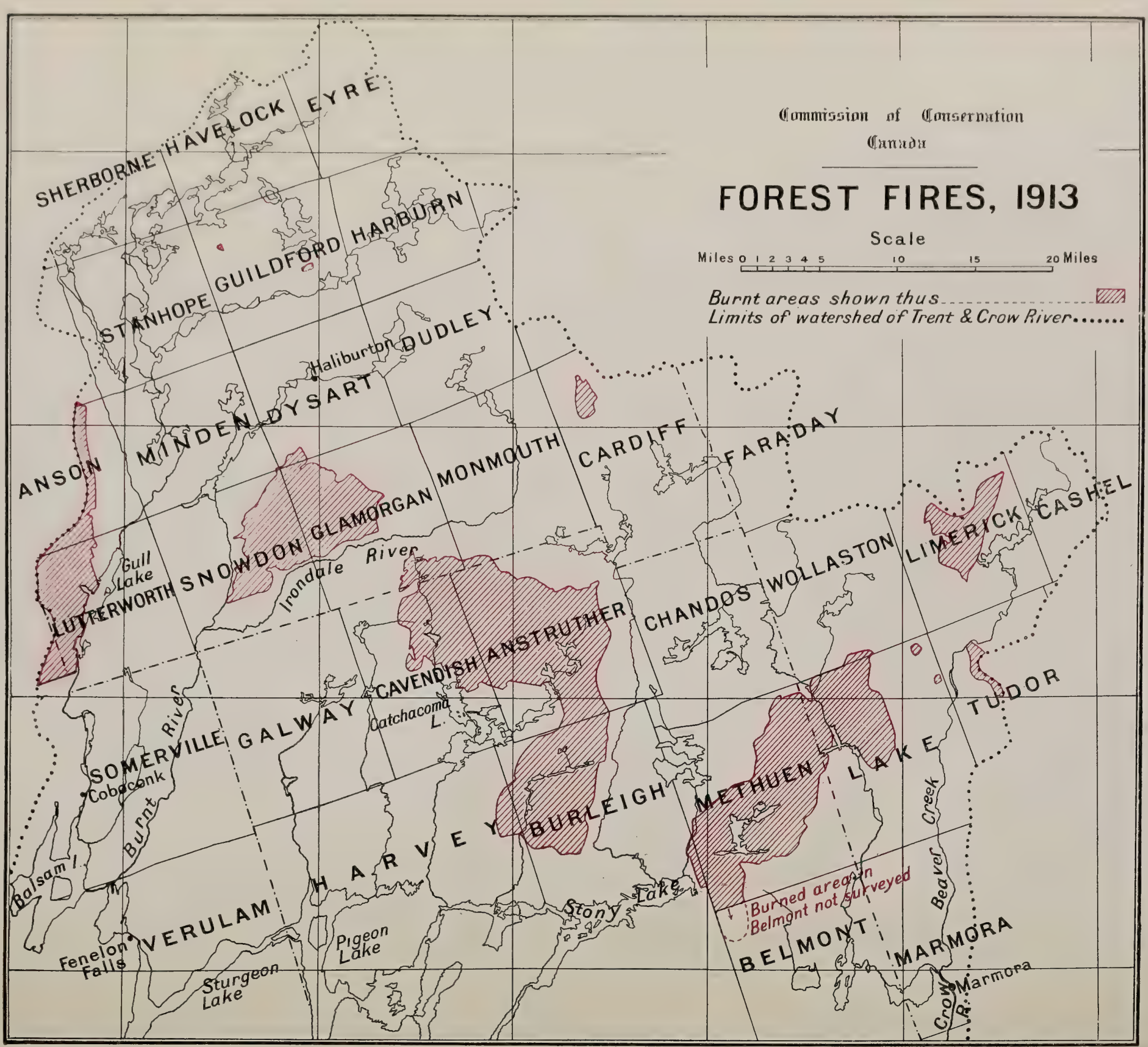
* The cut-over lands within timber limits are not actually patrolled by the fire rangers for reasons stated on pages 64 and 84.



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Canada

FOREST FIRES, 1913

Scale

Miles 0 1 2 3 4 5 10 15 20 Miles

Burnt areas shown thus ▨
Limits of watershed of Trent & Crow River ......

SHERBORNE
HAVELOCK
EYRE
STANHOPE
GUILDFORD
HARBURN
Haliburton
DUDLEY
DYSART
MINDEN
ANSON
MONMOUTH
CARDIFF
FARADAY
GLAMORGAN
SNOWDON
LUTTERWORTH
Gull Lake
Irondale River
CAVENDISH
ANSTRUTHER
CHANDOS
WOLLASTON
LIMERICK
CASHEL
TUDOR
LAKE
METHUEN
BURLEIGH
HARVEY
GALWAY
Catchacoma L.
SOMERVILLE
Coboconk
Burnt River
Balsam L.
VERULAM
Fenelon Falls
Sturgeon Lake
Pigeon Lake
Stony Lake
Burned area in Belmont not surveyed
BELMONT
MARMORA
Marmora
Beaver Creek
Crow R.

The sums accredited to the lumber companies were actually expended in wages and provisions for men fighting fires. The labour of farmers is placed at $2.00 per day. The number of days employed is obtained by accrediting to each farmer, whose property was endangered, an average of three days' work—a very moderate estimate. In most cases the women and children aided as well.

While in the field the licensees of the timber berths were interviewed with a view to arriving at an approximation of the amount of merchantable timber killed, but at the time of writing this valuation had not been completed by all of the owners. However, from estimates by the chief sufferers it appears probable that this will exceed $50,000.

Much of the standing timber killed by fire will be saved by immediate cutting, but every large operator reports more timber killed than he can possibly cut before it is rendered useless by disease. Moreover, as is well known, the cost of cutting and handling burned timber is greater than that of green timber. On account of these factors, it is difficult to estimate the actual loss in fire-killed timber.

The coming of the rain during the last week of August was providential, as it found the fire endangering farm buildings in nearly every township, and several villages would doubtless have been burned. Therefore, the loss of buildings was not as great as might have been expected. No farm buildings within the area considered by this report were burned, but several just outside of it were destroyed. One lumber company estimates its loss by way of camps, dams and equipment burned, at $15,000.

Farmers suffered severe losses through the burning of marsh hay. The farmers in some of the townships are always dependent upon the supply of marsh hay, and this was all the more pronounced during the past summer on account of the almost complete failure of the cultivated hay crop. In one township alone over 200 tons were burned. A moderate estimate would place the marsh hay burned at 800 tons. The hay was considered to be worth $8 a ton, which means a loss of $6,400. Another item to charge to the fire account in this respect is the destruction of the marshes upon which the farmers are dependent. Many of them were burned to the depth of two feet, the roots of the grasses being completely killed, so that it will be several years before they can regain their productiveness. The cost of rebuilding fences will be no small item to the farmers, for many miles of these have been burned.

The estimate of the actual damage caused by these fires, as given above, is sufficient to refute the claim that "No particular damage was done, as the fire ran through cut-over lands" ; but it is a mere bagatelle when compared with the potential loss in youth growth. On page 64 of this report, it is estimated that the cut-over lands, in which most of the recent fires were located, would yield at maturity on the average, seven cords of poplar pulpwood per acre. Of this area, 175,000 acres have been burned or, in other words, 1,225,000 cords of potential pulpwood. This at maturity, say in 25 years, would be worth one dollar a cord on the stump, or $1,225,000. The present value of $1,225,000 due in 25 years with interest at 4 per cent per annum, is $559,090. It is stated in the table on page 63 of the report that 75,000 acres within the Trent watershed contain on the average 30 young pine per acre. At least 50,000 acres of this type of land were burned by the recent fires. Had the young pines not been killed, they would have yielded 3,000 feet per acre at maturity, 50 years hence, or, in other words, 150,000 M feet. Reckoning the dues at $2 per M and the stumpage value at $7 per M, the value of this timber would have been $1,350,000. The present value of $1,350,000 due in 50 years at 4 per cent interest is $189,945. It is also shown in the table referred to above, that approximately 390,000 acres contain on the average 6 young pine trees per acre. Of this type 100,000 acres were burned. They would have yielded at maturity, 75,000 M feet of pine lumber with a value in dues and stumpage of $675,000. The present value of this sum due in 50 years with interest at 4 per cent per annum is $98,972.

It will be seen by the above estimates that the fires in the Trent valley last summer, destroyed young pine worth nearly $2,000,000 at maturity, and pulpwood worth nearly $1,000,000 at maturity. The present value of these sums is $848,000. This must be charged to the fire account, for the present capital stock of the forest in the Trent valley has been reduced by that amount. This reduction of future forest values by fire goes on without apparent abatement, yet the future supply of timber must come from these cut-over lands, which *at the present time are without fire protection.*

As stated above the crown lands containing merchantable timber are efficiently protected, but under the present system the cut-over lands are, as a general rule, entirely neglected. There are two causes of this condition of affairs. In the first place, there is the wide-spread belief that the cut-over lands are worthless, a belief that may be readily proven erroneous by anyone who studies the rate of reproduction of pine and poplar on such areas. Secondly, the timber-limit holder has no vital financial interest in his cut-over areas because they will eventually revert to the Crown. In fact it is not just to the limit holder that he should be required to protect the lands under this condition. Therefore in any far-sighted policy of forest administration it is essential that some method be devised adequately to protect the cut-over lands from fire. Forest fires can never be entirely eliminated, any more than can the fires in a town, but like the fires in a town, experience proves that they can be reduced to a minimum, even in a dry season. They must be reduced to a minimum if there is to be an adequate supply of forest products in the future.

II

Physiographic and Forest Conditions

I. Drainage, Topography, Geology, and Soils

The territory to which the present report refers is the drainage basin of the Trent Canal waters lying in the townships enumerated below, in general, those north of Kawartha lakes and Crow lake. The eastern boundary of the territory is formed by the drainage basin of Beaver creek, a tributary of the Crow river, in Hastings county ; and the western boundary by the drainage basin of Gull river in Haliburton and Victoria counties. The townships in Peterborough county lying between Stony lake and Rice lake were not included in the survey because of their prevailingly agricultural character. For the same reason the township of Verulam, lying north of Sturgeon lake, was not explored. With these exceptions, all the territory draining from the north into the Canal and lying between the eastern and western boundaries as given above, was explored. The region includes portions of Marmora, Tudor, Limerick, Cashel, Faraday and Wollaston townships and the whole of Lake township in Hastings county ; Methuen, Burleigh, Harvey, Galway, Cavendish, Anstruther and Chandos townships in Peterborough county ; Cardiff, Monmouth, Glamorgan, Snowdon, Lutterworth, Minden, Dysart, Guilford and Stanhope townships, and portions of Harcourt, Dudley, Harburn, Havelock, Sherborne, Hindon, and Anson townships in Haliburton county ; Somerville township in Victoria county, and a small portion of Ridout township in Muskoka district. The total area surveyed was 1,345,500 acres.

Drainage Basins—The Crow River drainage basin is the largest in the Trent watershed, including an area of 497,900 acres. The name is applied to the outlet stream of Round lake, in the township of Belmont. Its upward extension from Round lake is called North river. Between Round and Belmont lakes, it receives the waters of Otter creek ; Deer river falls into Belmont lake, and near the outlet of Crow lake, Beaver creek falls in. Of the tributaries, Deer river, and its northern extension, Paudash creek, is the largest, and drains 214,200 acres. Its headwaters are in southwestern Faraday and southeastern Cardiff. On its way to the Crow river it flows through three large lakes, the Paudash lakes in Cardiff, Belmont lake in Belmont, and Crow lake in Marmora, and receives the drainage of Loon lake in Chandos. Beaver creek drains 150,800 acres, and its principal storage basins are Salmon lake in Limerick and Little Salmon lake, and Devil lake in Cashel. Otter creek and North river drain only 57,500 acres. The latter has a large storage basin in Kasshabog lake in Methuen township. All of these waters reach the Trent canal in the township of

Seymour, where Crow river falls into the Trent. The total lake surface of the basin is 16,150 acres.

Two streams flow into Stony lake, namely, Jack creek, with a basin containing 46,900 acres, and Eels brook, with a basin containing 66,700 acres. The former is practically confined to the townships of Burleigh and Methuen, while the latter has a long narrow valley extending to southern Cardiff and Monmouth townships. The principal bodies of water in these two basins are Jack lake in northwestern Methuen and Eels lake, and the Monmouth lakes in the adjoining portions of Anstruther, Cardiff and Monmouth. The lakes in the two basins have an area of 6,900 acres.

Between Burleigh Falls and Hall Bridge, the canal receives the waters of Deer Bay creek and the Mississauga river. The former drains an area of 48,000 acres, and the latter an area of 99,900 acres. The Deer Bay Creek basin contains some twenty small lakes, mostly in the township of Burleigh, having a surface area of 2,550 acres, while the Mississauga has its storage basins in the Katchacoma-Mississauga-Gold-Eagle lake series in southern Cavendish and Anstruther, the total area of the lakes in its valley being 7,000 acres. Between Hall Bridge and Fenelon Falls, the canal has several small feeders, the more important being Squaw river and Harvey brook. The combined area of these drainage basins is 81,500 acres. With the exception of Swamp lake in Galway and Salmon lake in Cavendish, they do not contain lakes of considerable size. The lakes of the two basins cover 2,000 acres.

The Burnt River drainage basin is the second largest in size within the area, and contains 371,300 acres. The largest confluent of Burnt river, Irondale river, meets the main stream in the southwestern corner of Snowdon. It has its headwaters in Farquart lake in the township of Harcourt, and flows in a southwesterly direction through Monmouth, Glamorgan, and Snowdon. The main stream, commencing as the Haliburton river out of Drag lake in the township of Dudley, flows through the Kashogawigamog-Canning lake series in Dysart and Minden. The basin contains about 30 lakes of considerable size and they have an aggregate surface of nearly 23,000 acres.

Gull river, which flows into Balsam lake, drains an area of 324,200 acres, constituting the third largest drainage basin within the territory included by this report. The headwaters are formed by a network of lakes in Stanhope, Guilford, Havelock, and Sherborne townships. The basin as a whole contains 80 or more lakes. Three of the lakes, Redstone in Guilford, Kennisis in Havelock, and Gull lake in Lutterworth township have a combined surface area of 8,700 acres. The total lake surface in the basin is 40,900 acres.

Smaller basins not specifically mentioned have a total area of 127,400 acres.

Some 400 lakes are indicated on the map of this region. These reservoirs have a total area of 103,000 acres—7 per cent of the entire area.

Topography.—The country consists of innumerable low rounded hills and ridges. In the great majority of cases there is less than 100 feet difference in altitude between the streams and the ridges which separate them. Often the divides between the smaller streams are nearly flat or slightly rolling in character. When the higher ridges are ascended one sees an even sky-line and the country has the appearance of a flat plain into which countless depressions have been etched by the streams. Scattered over the region are occasional hills and ridges which stand from 200 to 300 feet above the general level of the plain, as, for example, in Tudor township between Millbridge and Glanmire, the Blue mountains in Methuen, the Green mountains in Glamorgan, and the granite ridges in central Anstruther. Along the northern limits of the watershed, the valleys are deeper and narrower, and the general elevation of the plain or plateau is about 1,250 feet above sea level. The northern portion of the watershed in Haliburton county is approximately 500 feet higher than Stony lake, and the southward slope of the plain is about 8 feet to the mile. The ridges, for the most part, have a northeast-southwest direction, and practically all the larger streams flow towards the southwest.

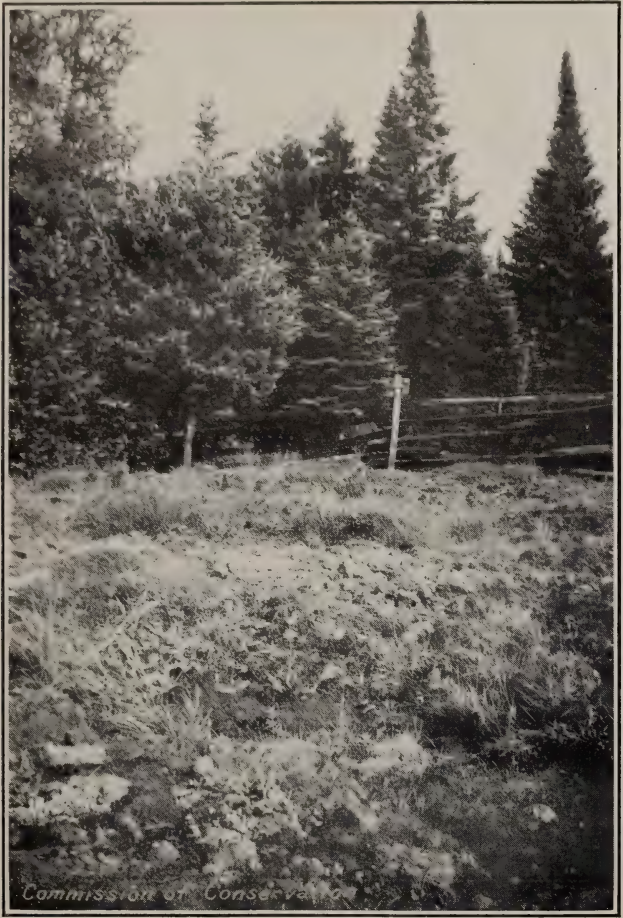
Geology.—The rocks of the region consist of various kinds of granite and gneiss, crystalline limestone, amphibolite, gabbro, diorite, syenite, and sedimentary limestone of Black River age. Except the Trenton limestone, none of these occur in large areas in pure condition, since both the granites and crystalline limestones are often mixed with bands of gneiss and amphibolite. The whole region was once covered with sedimentary rock, mostly limestone, and in some crustal movement of the earth the granite and other plutonic rocks were pushed up through it. The forces concerned changed the limestone into its present crystalline form and brought the amphibolites and gneisses into existence. Three distinctive lines of these intrusive rocks cross the area in a northeast-southwest direction, and, being harder than the surrounding rock, they constitute the higher points in the topography. The eastern line of intrusive rock is interrupted, but it can be traced through the Blue mountains in Methuen, "The Ridge" in southern Wollaston, and the rugged diorite ridges in the northeastern portion of the township. The middle line of eruptive rock extends northward through portions of Burleigh, Harvey, and Anstruther in a solid mass of gneissic granite, and then, with some interruptions, joins the great granitic outcrop to the north of the Trent watershed. The western outcrop of eruptive rock, begins in Galway and extends through

Snowdon and Glamorgan into Dysart, where it is interrupted, and then continues to the great northern mass of granite. The last two lines are composed of granite and related rock, the former averaging about 10 and the latter 8 miles in width. These two, as well as the eastern outcrop of volcanic rocks are surrounded by transformed sedimentary rocks. This sedimentary rock being softer, many of the stream valleys lie in it. This is notably the case with Deer creek, Jack creek, Eels brook, Irondale river, and Gull river for the greater part of its length. The rocks described above belong to what the geologists call the Grenville-Hastings series of the Palæozoic Era.

Sedimentary limestone of a different geological age (Cambro-Silurian) occurs in southern Marmora in a large block, continuing in scattered patches westward to central Harvey, where it extends with some intrusions of other kinds of rock, in a northwest direction through southern Galway and nearly diagonally through Somerville to the limits of the watershed.

Soils.—The region has suffered severely from glaciation, and the nature of the soils has been determined by it and by the excessive flow of waters during and immediately subsequent to the ice age. Many of the ridges were scoured clean of their soils, and the elapsed time since has not been long enough to restore them by natural processes to more than a very shallow depth. The killing of the protecting trees and the destruction of the humus by fires have resulted in washing off the soil in many cases, especially on the granite, so that now the ridges are bare. The rock of the low ridges and upland areas is covered by a thin mantle of glacial débris, mostly sand, gravel, and pebbles. It is rarely that one finds the soil on the uplands more than 18 inches deep, except in local pockets. This applies to farm lands, as well as to the forest lands. The flats between the low ridges have, at one time, been covered by glacial waters, and the débris has been more or less sorted, but the top layer of soil is sand interspersed with thin layers of gravel. These are the areas which were originally occupied by pine, and, unfortunately, they are now often occupied by farms. The stream valleys were filled with glacial drift and the present streams have worn their channels through it, forming sandy terraces along the slopes. In the western portion of the watershed particularly, most of the farms are in the stream valleys. The lower terraces, and especially the flood plains, contain, indeed, fairly good agricultural soil, but these areas are very limited in extent except in the lower courses of the larger streams.

As a whole, the soils of the area may be roughly grouped into three classes, which in sequence of their abundance are : stony, light, sandy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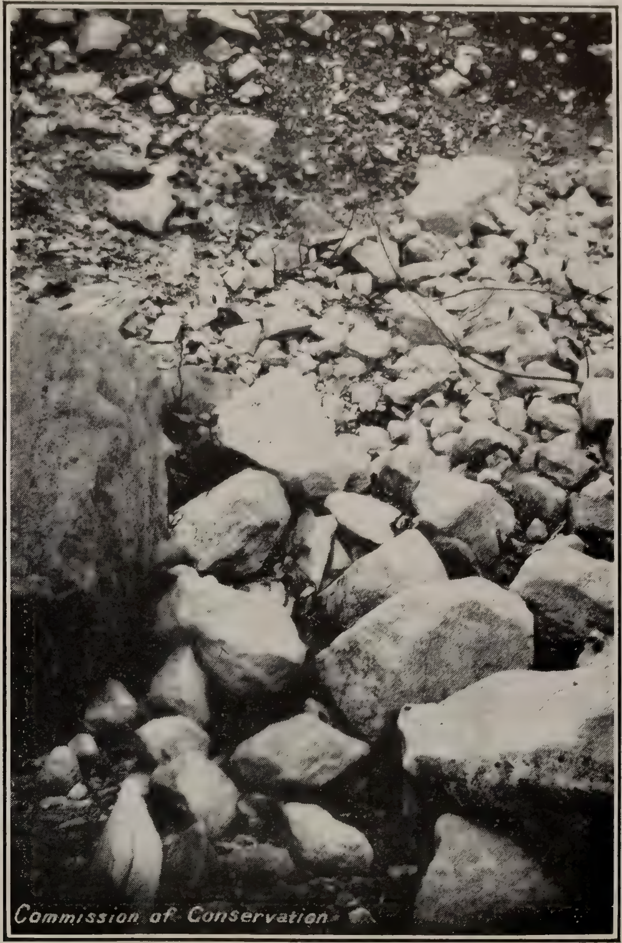
IN FOREGROUND, AN ABANDONED FARM STILL USED FOR PASTURE

Field beyond fence has not been pastured for many years ; note growth of balsam and tamarack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BANK SHOWING CROSS-SECTION OF THE SUBSOIL OF BOULDERS AND GRAVEL

Many tilled fields are similarly underlain and have poor water-holding capacity

loams ; sand ; and the heavier loams (silt loam and clay loam). The last named, however, are very restricted and form a very small percentage of the entire area.

II. The Condition of the Various Forest Types

In General

With reference to the kind of species, and, at the same time, to the character of the soils on which they grow, the forests of the Trent watershed were divided into the following four types : the hardwood type, the mixed coniferous-hardwood type, the pure coniferous type, and the poplar-birch type. Each of these will be discussed in detail in the following pages.

With reference to the degree of cutting, each of these types was classified as virgin, moderately culled, and severely culled. With reference to the age of reproduction, after clean cutting or after fire, the young forests were classified as second growth and young growth. In the final tabulation of the results of the field work—it was found that the area of virgin forests, with the exception of that in the holdings of one company in the extreme northern portion of the territory—amounted to less than 700 acres. The virgin condition was, therefore, grouped with the moderately culled condition. By 'moderately culled' is meant a forest from which the better class of saw-logs has been removed. This condition is most common in the hardwood forests, where the basswood, elm, ash, and, sometimes, the better quality of maple have been cut, leaving the forest almost pure maple and beech, yet of a quality which could be further utilized for saw-logs. In such cases the crown cover remains practically unbroken. Only 22 per cent of the mature forest is in the condition designated as moderately culled.

In the severely culled forest, practically all the merchantable saw-logs have been removed, leaving material fit only for cordwood, charcoal, or wood distillation products in the case of the hardwoods. This condition is the prevailing one in the hardwood type because a large percentage of it is composed of farm wood-lots, in which a long continued selection system of cutting has led to this result. In the majority of cases the crown cover in such a forest is unbroken, and it is only by a close inspection of the interior that the real condition of the forest is disclosed. Where, however, cuttings for fuel or for wood distillation products have been made in the hardwood forest, the crown cover has been very severely broken ; in fact, only scattering trees of non-commercial species remain. Nearly 8,000 acres of this type of cutting were found in the northern townships, principally in Dysart and Dudley. Under the heading of 'severely culled' in the hardwood type, therefore, a considerable range of conditions is included. The greater portion of it still has an unbroken crown cover and is composed of over-mature trees and abundant young material nearly ready for the axe. While the saw-logs considered merchantable under the present standards have been chiefly removed, yet the severely culled hardwood forest type contains large quantities of material utilizable in the minor wood-working industries. In the mixed types and in the pure coniferous types, the severely culled condition prevails, for the lumberman takes practically everything, so that only scattered poles and saplings remain.

Excluding the recent burns, the old burns, the barrens, and the young growth, mature forests in the Trent watershed occupy 397,700 acres, and of these 310,300 acres, or 78 per cent, have been severely culled.

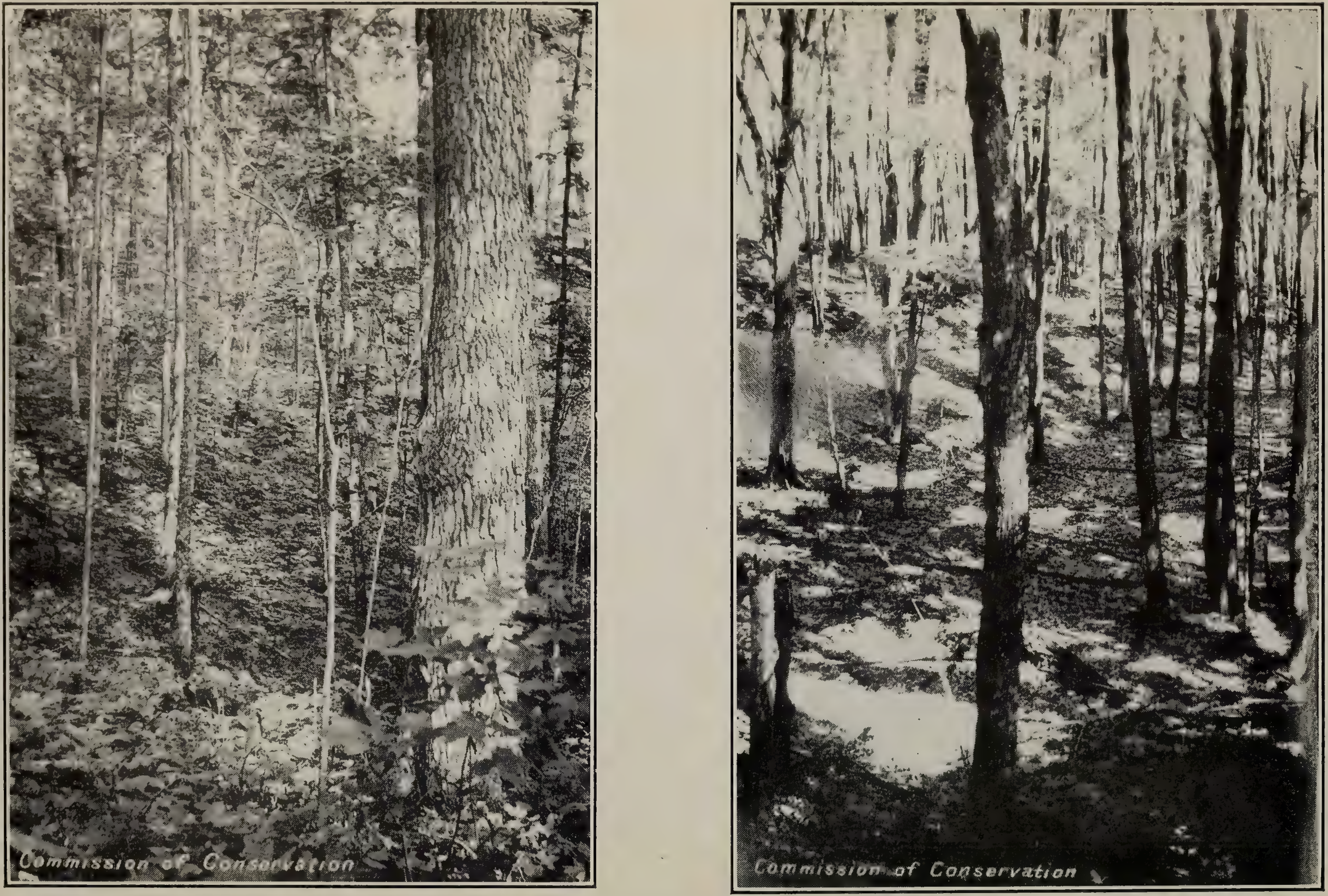
As a result of clean cutting or fires, frequent young stands of maple, beech, and birch; of pine, hemlock and balsam; and of a mixture of these are found. Such stands were divided according to age into 'young growth' and 'second growth', the former being from 20 to 40 years, and the latter from 40 to 60 years old. The stands of young growth aggregate 12,070 acres, and the stands of second growth only 7,890 acres. The young growth and second growth of birch and poplar, mostly arising as the result of fires, were classified separately.

The classification of the mature forest areas into three general types, namely, 'pure hardwood,' 'pure conifer,' and 'mixed,' is based upon the degree of intermixture of the two classes. For example, a hardwood forest was considered pure, if the mixture of conifers among the dominant trees did not exceed 10 per cent ; a coniferous forest was considered pure, if the intermixture of hardwoods was not greater than 10 per cent ; stands of greater than a 10 per cent mixture of conifers or hardwoods were designated as a mixed type.

The areas represented on the maps and in the tables as 'recently burned,' *i.e.* burned within the past four years, do not give the real extent of the recent fires because they refer only to the areas where the trees were killed. Areas over which fires had run, killing the young growth but not the mature trees, were classed as forested. The barrens and semi-barrens recently burned were not included.

It should be noted that in those townships not lying wholly within the Trent watershed, the percentages of the area and distribution of the forest refer only to the portions surveyed and not to the townships as a whole.

In the appended tables certain townships are separately enumerated, and the area of these lands is not included in determining the percentages of the various forest types. These lands are privately owned, mostly by one company, and with one exception they are practically unsettled, and, for the most part, almost entirely untouched. They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TWO EXAMPLES OF MAPLE FORESTS

The one shown in the right hand view has suffered from successive ground fires. Note difference in reproduction in the two cases represent a different type of forest than that farther south, being pure hardwoods, or mixed conifers and hardwoods, in virgin or semi-virgin condition. The primary object of the survey being to determine the conditions on cut-over and burned-over lands, these townships were considered separately.

The composition of the various forest types as described in the following pages was determined by means of sample plots, which for the most part, were made in strips one chain wide and ten chains long, so as to obtain as nearly as possible the average conditions. The trees of the various species were classified as saplings, poles, standards, and veterans. The saplings are from 1 inch to 4 inches in diameter ; the poles from 4 to 12 inches ; the standards from 12 to 24 inches ; and the veterans over 24 inches in diameter.

The Hardwood Type

The hardwood forest type occupies a little over one-quarter of the area included in this report, and almost one-third of the total woodland area. Excluding the young growth of all kinds we find that the mature hardwood forest occupies over three-quarters of the entire mature forest ; in other words, pure hardwood is the prevailing type. Within the hardwood type only 0.15 per cent is in virgin condition, and 19.7 per cent of it is semi-virgin. On most of the balance nearly all the saw-logs have been removed, that is, it has been severely culled. Young growth less than 40 years old covers less than three per cent of the hardwood area, and second growth, nearly ready for the axe, hardly one per cent.

The hardwoods occupy the deeper glacial drift soils, which, for the most part, are sandy loams, but stony. They are found on the higher ridges, if these are well covered with soil, without regard to the nature of the underlying rock. They also often occur on the low sandy flats lying betewen the ridges once occupied by pine. There seems to be little difference in the composition of the soil of such sites and that of the adjoining pine lands, except that the water-table is higher, and hence the soil is much more moist. In addition, since these areas have never been burned over, the soil contains more vegetable matter. Such hardwoods as occupy relatively shallow soils are confined to those overlying the sedimentary limestone, which skirts the southern portion of the region.

In the southern two-thirds of the drainage basin, the hardwoods are localized and irregularly distributed in patches, being surrounded by former pine lands. There are, however, some exceptions to this condition. For example, there is a large, continuous block of hardwoods in the eastern portion of Lake township. Another of the same kind may be found in northern Anstruther and southeastern Monmouth. These are areas where the rocks have been covered to much more than the usual depth with glacial débris. In the northern third of the drainage basin, the townships of Stanhope, Guilford, Minden, Dysart, and Dudley are deeply overlain by drift, and the forest conditions of the southern portion are reversed, that is, the hardwoods or mixed forests are the prevailing types, and the pine lands are localized within them.

In order to determine the composition of the hardwood type, the trees of the various species were counted and classified according to diameters, after the manner explained above. Sample plots to the extent of 16 acres were made in various places scattered through the region. Most of these were taken in small patches of virgin stands or, if trees had been removed, the stumps were counted as standing trees, the object being to determine the composition of the original hardwood forest. The results of such determinations are given in the following pages.

The three plots given below were made in Lake township.

NUMBER OF TREES PER ACRE ON A LOW FLAT BETWEEN SLOPES

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	..	12	4	12	28	31.8
Basswood	..	4	4	8	16	18.2
Beech	..	4	4	4	12	13.6
Yellow Birch	4	4	..	4	12	13.6
Elm	..	4	4	..	8	9.1
Hemlock	..	4	..	4	8	9.1
Ash	..	..	..	4	4	4.6
Total	4	32	16	36	88	100.0
Per cent	4.5	36.4	18.2	40.9		

NUMBER OF TREES PER ACRE ON A GENTLE SLOPE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	8	8	72	512	600	55.6
Beech	..	24	72	320	416	38.5
Hemlock	..	..	16	32	48	4.5
Yellow Birch	..	8	..	..	8	0.7
Basswood	..	..	8	..	8	0.7
Total	8	40	168	864	1,080	100.0
Per cent	0.8	3.6	15.6	80		

NUMBER OF TREES PER ACRE ON A BENCH ABOUT 50 FEET ABOVE THE FLAT

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	40	8	32	288	368	38.0
Beech	..	24	80	136	240	24.8
Yellow Birch	..	8	24	144	176	18.2
Basswood	..	..	48	48	96	9.9
Hop Hornbeam	..	..	8	48	56	5.8
Balsam	..	..	24	..	24	2.5
Large-toothed Aspen	..	..	8	..	8	0.8
Total	40	40	224	664	968	100.0
Per cent	4.1	4.1	23.2	68.6		

These plots were taken successively from the base to near the top of the slope, where the type was mixed.

The average of the three sites—low flat, slope and bench—shows the average composition of the hardwood type to be : sugar maple, 41.8 per cent ; beech, 25.6 per cent ; yellow birch, 10.8 per cent; basswood, 9.6 per cent; hemlock, 4.5 per cent; elm, 3 per cent; hop hornbeam, 1.9 per cent; ash, 1.8 per cent ; balsam, 0.8 per cent; large-toothed aspen, 0.2 per cent. If we ignore the poles and saplings and consider only the dominant or log trees the composition becomes: sugar maple, 46.4 per cent ; beech, 31.7 per cent ; yellow birch, 14.7 per cent ; basswood, elm, and hemlock, each 2.4 per cent. And, if we assume that the poles and saplings as given above all come to maturity, replacing the dominant trees, the complexion of the forest would still remain much the same. The poles and saplings per acre aggregate 1,972, and, as a class, their composition is distributed as follows : sugar maple, 46.7 per cent ; beech, 31.23 per cent ; yellow birch, 8.72 per cent ; basswood, 5.9 per cent ; hornbeam, 2.9 per cent ; hemlock, 2.6 per cent ; balsam, 1.2 per cent ; aspen, 0.4 per cent ; ash and elm, each 0.2 per cent. This shows strikingly that the two leading species, maple and beech, will hold their present position in the future forest, and, since this is in virgin forest, it indicates that they are fully adjusted to their environment. It is what is called a "climax forest," the ultimate result of adaptations.

To show the variations which may occur in this type, the following sample areas are enumerated. A strip run through the northwestern corner of Lake township from the base of a slope to a mixed type on its crest, showed the following composition.

Number of Trees per Acre on a Flat at the Base of a Slope

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	..	10	20	70	100	58.8
Beech.............	..	30	10	30	70	41.2
Total............	..	40	30	100	170	100.0
Per cent.........	..	23.6	17.6	58.8		

Number of Trees per Acre on a Gentle Slope

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	4	4	16	36	60	60
Beech.............	..	16	20	4	40	40
Total...........	4	20	36	40	100	100
Per cent	4	20	36	40		

Number of Trees per Acre on a Bench near the Top of a Slope

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Beech.............	..	4	36	56	96	45.3
Sugar Maple.......	20	24	..	44	88	41.6
Hop Hornbeam.....	..	..	4	16	20	9.4
Hemlock..........	..	8	..	..	8	3.7
Total...........	20	36	40	116	212	100.0
Per cent........	9.4	17	18.9	54.7		

Taking the average composition of these three site classes, we find the composition as a whole to be : maple, 53.4 per cent ; beech, 42.2 per cent ; hop hornbeam, 3.1 per cent. ; hemlock, 1.2 per cent.

A sample strip of an acre in Wollaston showed the following composition of the hardwood type.

NUMBER OF TREES PER ACRE ON A MEDIUM SLOPE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	20	52	40	20	132	85.0
Beech	..	8	..	..	8	5.0
Basswood	..	8	..	..	8	5.0
Yellow Birch	..	..	4	..	4	2.5
Hop Hornbeam	..	..	4	..	4	2.5
Total	20	68	48	20	156	100.0
Per cent	12.8	43.6	30.8	12.8		

In the township of Chandos a sample acre in a virgin hardwood forest revealed an almost pure maple type as is shown below.

NUMBER OF TREES PER ACRE ON A MEDIUM SLOPE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	..	28	124	..	152	95.0
Elm	4	..	..	..	4	2.5
Hop Hornbeam	..	..	..	4	4	2.5
Total	4	28	124	4	160	100.0
Per cent	2.5	17.5	77.5	2.5		

Sample plots in the large block of hardwoods in northern Anstruther show them to be of the following composition.

NUMBER OF TREES PER ACRE ON A FLAT PLATEAU

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Beech	6	42	80	46	174	63.5
Sugar Maple	12	..	2	80	94	34.3
Hemlock	..	..	4	..	4	1.5
Yellow Birch	2	..	..	..	2	0.7
Total	20	42	86	126	274	100.0
Per cent	7.3	15.3	31.4	46		

Regarding only the dominant trees one finds the stand to be 77.4 per cent beech, 19.4 per cent sugar maple, and 3.2 per cent yellow birch. The soil was a foot deep to a pavement of stones. Compared with the maple, the beech occupies the thinner, more stony soils. This fact is known to the farmers of the region, who avoid clearing beech lands. On an adjacent ridge where the soil was from 24 inches to 30 inches deep the stand was mostly maple, as is shown below.

NUMBER OF TREES PER ACRE ON A LOW RIDGE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	4	50	54	70	178	69.2
Hemlock	2	2	22	..	26	10.1
Basswood	..	6	8	..	14	5.5
Hop Hornbeam	..	..	12	..	12	4.7
White Ash	..	2	2	6	10	3.9
Beech	..	2	6	1	9	3.5
Yellow Birch	4	2	..	..	6	2.3
Balsam	..	..	..	2	2	0.8
Total	10	64	104	79	257	100.0
Per cent	3.9	24.9	40.5	30.7		

Considered from the standpoint of the dominant trees, the stand shows 73 per cent maple, 8.1 per cent each of basswood and yellow birch, 5.4 per cent hemlock, 2.7 per cent each of white ash and beech.

In the virgin hardwood in Cavendish a sample acre showed the following composition.

Number of Trees per Acre on a Flat between Low Ridges

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	10	38	54	78	180	74.4
Elm...............	..	8	16	..	24	10.0
Basswood..........	..	..	2	20	22	9.1
Yellow Birch.......	..	2	6	..	8	3.3
Hemlock..........	..	..	6	..	6	2.4
Black Cherry......	..	..	2	..	2	0.8
Total...........	10	48	86	98	242	100.0
Per cent.........	4.2	19.8	35.5	40.5		

As to dominant species the stand consisted of sugar maple 82.7 per cent, elm 13.8 per cent, yellow birch 2.5 per cent.

The trees were counted on four acres in the hardwood forest lying between Eagle lake and Redstone lake in the township of Guilford. The composition on the various sites is as follows.

Number of Trees per Acre at the Base of a Slope

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	2	9	14	26	51	60.0
Basswood..........	1	3	4	3	11	13.1
Beech.............	..	3	4	2	9	10.5
Yellow Birch.......	3	2	2	..	7	8.2
Hemlock..........	..	..	3	..	3	3.5
Hop Hornbeam.....	..	..	3	..	3	2.3
Elm...............	1	..	..	..	1	1.2
Balsam...........	..	..	1	..	1	1.2
Total...........	7	17	31	31	86	100.0
Per cent.........	8	20	36	36		

If one considers only the dominant trees, the stand becomes : maple 45.8 per cent ; yellow birch 20.8 per cent ; basswood 16.7 per cent ; beech 12.5 per cent ; elm 4.2 per cent.

Number of Trees per Acre on a Medium Slope

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Beech.............	..	12	44	34	90	46.4
Sugar Maple.......	6	12	2	32	52	26.8
Basswood..........	6	12	4	10	32	16.5
Yellow Birch.......	4	10	2	..	16	8.3
Elm...............	..	..	2	..	2	1.0
Hop Hornbeam.....	..	..	2	..	2	1.0
Total...........	16	46	56	76	194	100.0
Per cent........	8.2	23.7	28.9	39.2		

Considering only the mature trees, one finds the stand to be 29 per cent each of maple and basswood, 22.6 per cent of yellow birch, 19.4 per cent of beech.

Number of Trees per Acre on a High Bench

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	8	5	23	45	81	61.0
Beech.............	..	16	25	..	41	30.8
Basswood..........	1	3	1	1	6	4.5
Hop Hornbeam.....	..	..	3	..	3	2.2
Yellow Birch.......	1	1	..	..	2	1.5
Total...........	10	25	52	46	133	100.0
Per cent........	7.5	18.8	39.1	34.6		

The composition of the dominant trees on this area is distributed as follows : beech 45.7 per cent ; maple 37.2 per cent ; basswood 11.4 per cent ; yellow birch 5.7 per cent.

NUMBER OF TREES PER ACRE AT THE TOP OF A SLOPE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Beech.............	2	48	22	66	138	71.9
Sugar Maple.......	2	4	4	30	40	20.9
Yellow Birch.......	2	4	4	..	10	5.2
Hemlock..........	..	2	..	..	2	1.0
Hop Hornbeam.....	..	..	2	..	2	1.0
Total...........	6	58	32	96	192	100.0
Per cent.........	3.1	30.2	16.7	50		

Without the poles and saplings, the stand has the following composition: Beech 78.1 per cent; maple and yellow birch each 9.4 per cent; hemlock 3.1 per cent. It is characteristic of the beech to be more abundant in the shallow soils at the top of the ridges.

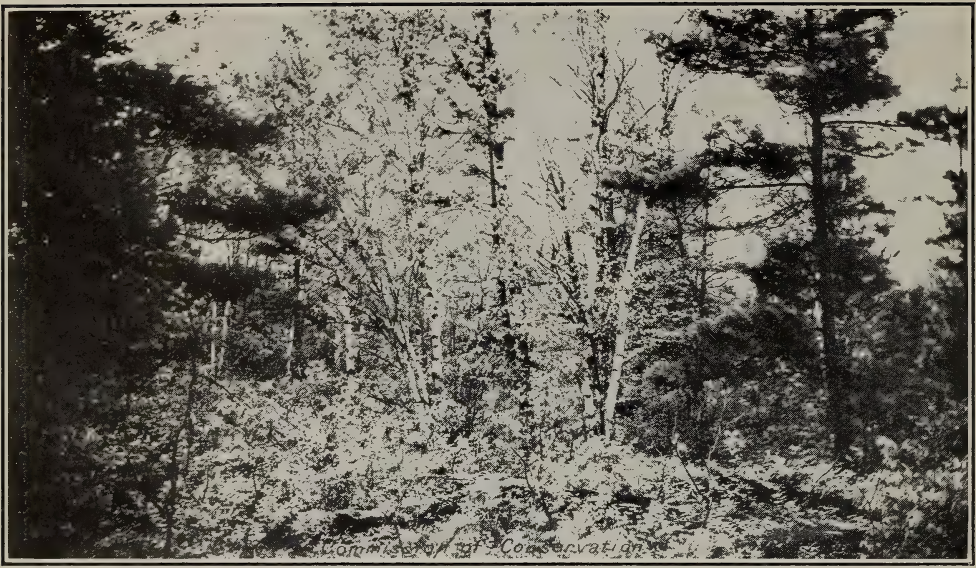
Regarding these four site classes as representative, we would find the composition of the hardwood forest near Redstone lake in Guilford to be: maple 42 per cent; beech 40 per cent; basswood 8.6 per cent; yellow birch 5.8 per cent; hop hornbeam 1.6 per cent; hemlock 1.1 per cent; elm 0.6 per cent; and balsam 0.3 per cent.

The tables above give a good idea of the variations in composition of the hardwood forest in the northern and central portions of the area under consideration in this report. The hardwood forest on the sedimentary limestone which occurs interruptedly across the southern boundary of the watershed contains, relatively, more basswood, hop hornbeam, ash, red oak, and white oak, and it was the only place where burr oak was seen. Pure stands of hop hornbeam and of oak were frequent.

Since settlement is more extensive on these soils, some difficulty was experienced in finding a virgin stand on the sedimentary limestone. The following plot, however, was made on a lot in Harvey township, where there was no indication that trees had been removed.

NUMBER OF TREES PER ACRE ON A GENTLE SLOPE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple.......	4	25	1	108	138	29.7
Basswood..........	1	12	50	60	123	26.5
Hop Hornbeam.....	..	..	7	110	117	25.2
Ash..............	..	..	5	48	53	11.4
Beech.............	..	..	2	18	20	4.3
Red Oak..........	..	..	2	6	8	1.7
White Pine........	..	..	1	3	4	0.8
Hemlock..........	..	..	1	1	2	0.4
Total...........	5	37	69	354	465	100.0
Per cent.........	1.1	8.0	14.8	76.1		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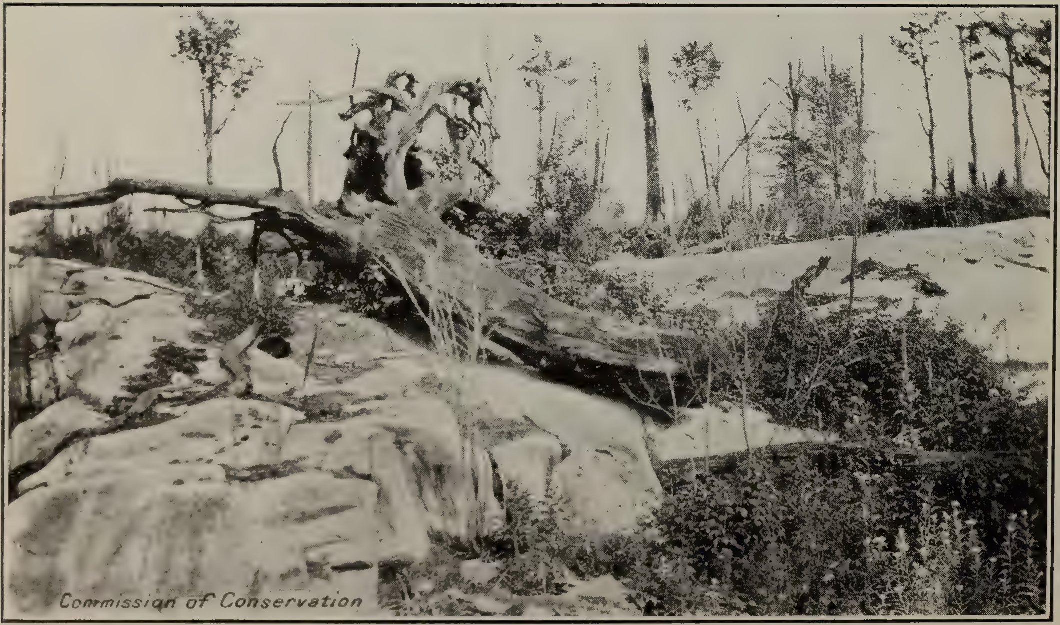
A MIXED TYPE,—BIRCH AND PINE, ON THIN GRANITIC SOIL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A SIMILAR SITUATION WHICH HAS SUFFERED SUCCESSIVE FIRES

The average number of trees of the various age classes per acre, and the average composition by species of 16 acres of sample plots are given in the table below.

Average Number of Trees of Various Species per Acre on Sample Plots Aggregating 16 Acres

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	8.7	20.8	30.0	104.2	163.7	51.19
Beech	0.5	14.5	25.3	44.8	85.1	26.61
Basswood	0.5	3.0	7.9	17.5	28.9	9.04
Yellow Birch	1.2	2.5	2.5	9.2	15.4	4.82
Hop Hornbeam	...	....	2.8	11.1	13.9	4.34
Hemlock	0.1	1.0	3.1	2.3	6.5	2.03
Elm	0.3	0.7	1.3	......	2.3	0.72
Balsam	...	....	1.5	0.1	1.6	0.50
Ash	...	0.1	0.4	0.6	1.1	0.35
Aspen	...	....	0.5	.....	0.5	0.16
Red Oak	...	....	0.1	0.3	0.4	0.13
White Pine	...	....	0.06	0.2	0.26	0.08
Black Cherry	...	....	0.1	.....	0.1	0.03
Total	11.3	42.6	75.56	190.3	319.76	100.00
Per cent	5.1	20.3	30.7	43.9		

As will be seen from these records, the poles and saplings of the leading species are abundant, a hopeful condition, assuring the reproduction of the forest of the same nature. Where the forest has been thinned by lumbering, the vigour of the reproduction is all the more striking. In such situations one often finds dense thickets of young maple, beech, and yellow birch. Maple, however, is by far the most abundant among the seedlings and small saplings. One finds it everywhere. Sometimes a dense carpet of maple seedlings covers several acres to the exclusion of nearly all other plants.

The Mixed Type

The mixed forest type as exhibited on the accompanying map represents in reality a combination of two distinct types, namely the mixed hardwood-conifer type of the well drained areas, and a mixed swamp type. This swamp type representing nearly one-half of the combination, is the ordinary black ash-cedar-balsam swamp. In the former type, which is found on the flats and at the bases of slopes along streams and lakes, and on some of the low ridges rising above the pure hardwood forest, the principal conifer associated with the hardwood is hemlock ; balsam usually holds the second place. The combination, as given on the map, occupies 59,600 acres, or 5.1 per cent of the entire area and 6.1 per cent of the forested area. A little more than one-fifth of the mixed type is moderately culled ; nearly three-fourths is severely culled ; and the remaining one-twentieth is young growth and second growth.

A few sample plots were made in the former type, and the tables below indicate its composition.

NUMBER OF TREES PER ACRE ON THE CREST OF A LOW RIDGE, LAKE TOWNSHIP

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Hemlock	40	136	160	336	44.4
Sugar Maple	8	32	168	208	27.3
Beech	24	48	104	176	23.1
Yellow Birch	16	...	16	32	4.2
Hop Hornbeam	..	8	...	8	1.0
Total	88	224	448	760	100.0
Per cent	11.6	29.5	58.9		

A sample plot was made in Wollaston on a gentle slope rising from a cedar swamp. While the stand was mostly composed of hardwoods, yet it contained enough hemlock to bring it into the mixed type.

NUMBER OF TREES PER ACRE ON A GENTLE SLOPE NEAR A SWAMP, WOLLASTON TOWNSHIP

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Sugar Maple	10	10	60	20	100	58.2
Hemlock	..	20	30	..	50	29.0
Beech	..	20	..	2	22	12.8
Total	10	50	90	22	172	100.0
Per cent	5.8	29.1	52.3	12.8		

A slope arising from a stream in Anstruther had a mixed forest with the composition given below.

NUMBER OF TREES PER ACRE ON A SLOPE FROM A STREAM, ANSTRUTHER TOWNSHIP

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Hemlock	..	25	12	14	51	37.0
Sugar Maple	2	15	7	..	24	17.4
Balsam	..	..	5	11	16	11.6
Basswood	..	1	9	3	13	9.4
Yellow Birch	1	9	3	..	13	9.4
Beech	..	1	6	3	10	7.2
Hop Hornbeam	..	..	7	..	7	5.1
Cedar	..	..	2	1	3	2.2
Ash	..	..	..	1	1	0.7
Total	3	51	51	33	138	100.0
Per cent	2.1	37.0	37.0	23.9		

The sample plot below was made in Guilford township on a gentle slope from a small lake.

NUMBER OF TREES PER ACRE ON A GENTLE SLOPE FROM A LAKE

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Hemlock	..	32	40	..	72	35.0
Balsam	..	12	..	22	34	16.5
Sugar Maple	2	22	6	..	30	14.5
Yellow Birch	..	6	18	4	28	13.6
Basswood	..	6	12	4	22	10.7
Hop Hornbeam	..	..	12	2	14	6.7
Cedar	..	..	..	4	4	2.0
Black Spruce	..	2	..	..	2	1.0
Total	2	80	88	36	206	100.0
Per cent	1.0	38.8	42.7	17.5		

The average number and percentage of individuals of the various species, and of the various age classes, on an acre, is shown in the table below.

AVERAGE NUMBER OF TREES PER ACRE OF THE VARIOUS SPECIES AND AGE CLASSES—HIGHLAND TYPE (4 Acres)

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Hemlock	...	29.2	54.5	43.5	127.2	40.0
Sugar Maple	3.5	13.7	26.2	47.0	90.4	28.4
Beech	...	11.2	13.5	27.2	51.9	16.3
Yellow Birch	0.2	7.7	5.2	5.0	18.1	5.7
Balsam	...	3.0	1.2	8.2	12.4	3.9
Basswood	...	1.7	5.2	1.7	8.6	2.5
Hop Hornbeam	...	....	6.7	0.5	7.2	2.3
Cedar	...	....	0.5	1.2	1.7	0.6
Black Spruce	...	0.5	....	.....	0.5	0.2
Ash	...	....	....	0.2	0.2	0.1
Total	3.7	67.0	113.0	134.5	318.2	100.0
Per cent	2.2	29.1	40.4	28.3		

The mixed swamp type is found on the lowlands bordering streams and lakes. While frequent throughout the Trent watershed, it is most abundant in the two southern tiers of townships. In the northern townships, it is replaced by coniferous swamps. As a rule, black ash and cedar comprise three-fourths of the stand, and it is from such swamps that large quantities of cedar poles are taken. When these swamps are cleared and drained they make excellent farm soils, in fact, in some townships the only good farms are on such soils.

Sample plots totalling an acre were made in the mixed swamp in various places in the township of Wollaston, and the results are shown in the table below.

NUMBER OF TREES PER ACRE IN THE MIXED SWAMP TYPE, WOLLASTON TOWNSHIP

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Black Ash	..	26	44	368	438	47.0
Cedar	10	24	80	180	294	31.5
Balsam	...	2	62	80	144	15.5
Yellow Birch	...	..	18	16	34	3.7
Hemlock	...	4	6	6	16	1.7
Elm	...	..	..	4	4	0.4
Basswood	...	..	2	...	...	0.2
Total	10	56	212	654	930	100.0
Per cent	1.1	6.0	22.7	70.2		

A strip a chain wide and ten chains long was run through a mixed swamp on Paudash creek in Chandos with the following result :

NUMBER OF TREES PER ACRE IN THE MIXED SWAMP TYPE, CHANDOS TOWNSHIP

SPECIES—	Veterans	Standards	Poles	Saplings	Total	Per cent
Black Ash	..	32	49	91	172	36.9
Cedar	..	14	65	83	162	34.8
Balsam	..	3	14	18	35	7.5
Black Spruce	..	9	15	10	34	7.3
Hemlock	1	6	20	5	32	6.9
Yellow Birch	..	16	6	3	25	5.4
Maple	..	..	2	2	4	0.8
Elm	..	..	2	..	2	0.4
Total	1	80	173	212	466	100.0
Per cent	0.2	17.2	37.1	45.5		

The average acre shows the following age class relations.

Average Number of Trees per Acre of the Various Species and Age Classes—Swamp Type (2 Acres)

Species—	Veterans	Standards	Poles	Saplings	Total	Per cent
Black Ash	...	29.0	46.5	229.5	305.0	41.9
Cedar	5	19.0	72.5	131.5	228.0	33.2
Balsam	...	2.5	38.0	49.0	89.5	11.5
Yellow Birch	...	8.0	12.0	9.5	29.5	4.6
Hemlock	0.5	5.0	13.0	5.5	24.0	4.3
Black Spruce	...	4.5	7.5	5.0	17.0	3.6
Elm	...	....	1.0	2.0	3.0	.4
Maple	...	....	1.0	1.0	2.0	.4
Basswood	...	....	1.0	...	1.0	.1
Total	5.5	68.0	192.5	433.0	699.0	100.0
Per cent	.6	11.6	29.9	57.9		

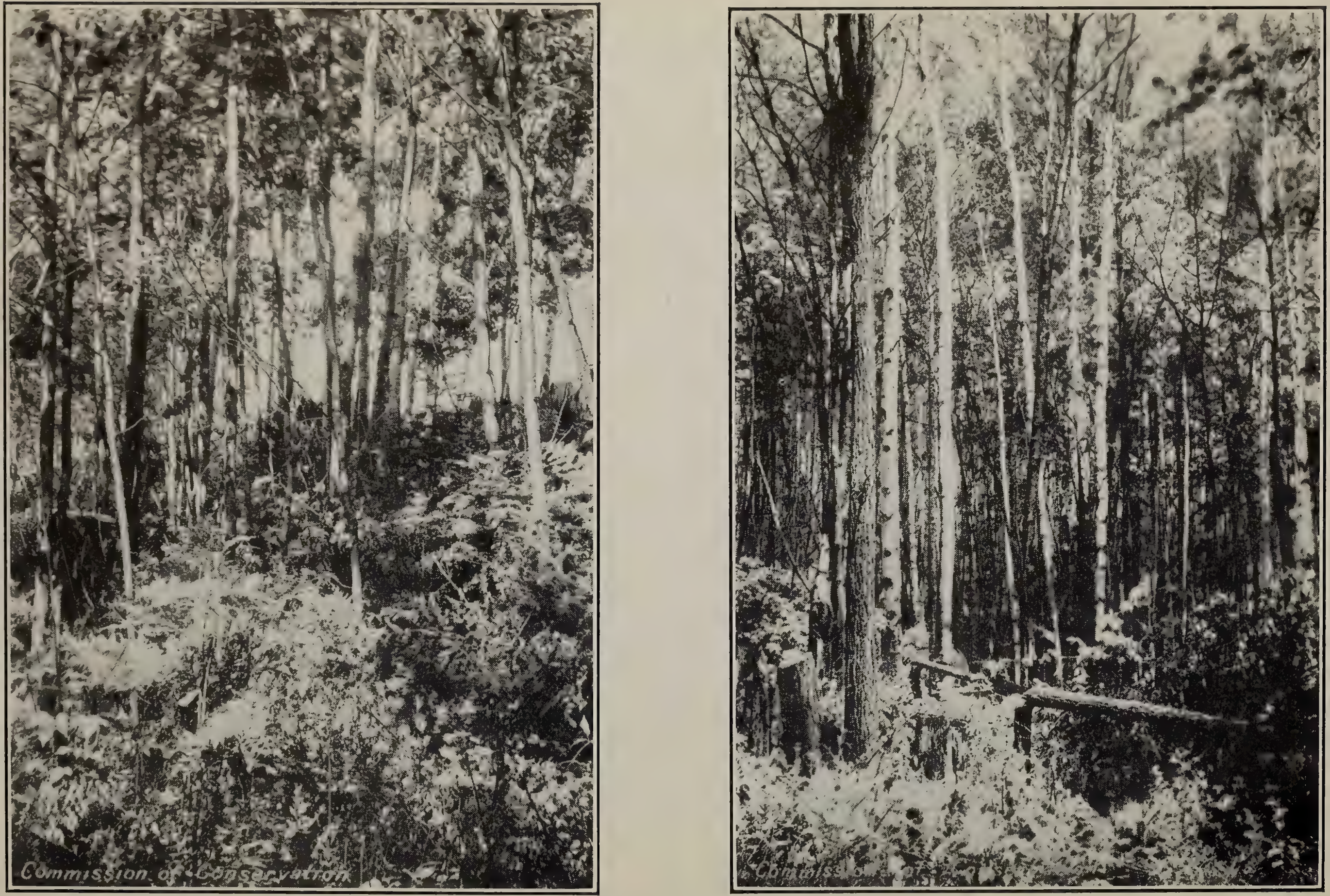
The Coniferous Type

The coniferous forest type, as presented on the accompanying maps and in the appended tables, is composed of three distinct types: the hemlock type, the pine type, and the coniferous swamp type. Taken together, they occupy to-day only a small area, less than 5 per cent of the total woodland. Only a few acres are virgin; about one-third is moderately culled, while four-fifths of the area is severely culled. The second growth and young growth occupy about one-eighth of the coniferous forest type.

The hemlock type is found in patches on low land surrounding lakes throughout the area, but is most extensive in the northern portion. The largest block in the southern portion of the area is found in western Anstruther and eastern Cavendish. No sample plots were made in this type, but it is safe to say that three-fourths of such stands is hemlock.

Some 500,000 acres, or 57.3 per cent of the forested area were once occupied by pine, chiefly white pine, but, owing to repeated fires, following lumbering operations, the pine forests now exist only in relatively small patches. Such as do exist are advanced second growth from 60 to 100 years old; the original virgin pine has been practically eliminated from the area.

Sample plots were made in a stand of white pine between 60 and 70 years old in the township of Marmora. The stand had occupied about 57 acres and had been recently cut. The pine occupied two site classes, the ridges and the flats between the ridges. The soil, a sandy loam, averaged 17 inches in depth on the flats and 8 inches on the ridges. From the former site, 150 trees per acre, averaging 11.9 inches in diameter had been taken, while, from the latter, 55 trees per acre averaging 11.5 inches in diameter had been removed. The average yield per acre was 3,400 board feet. Fire scars on the trees revealed the fact that the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TWO TYPES OF REPRODUCTION AFTER FIRE
On left, pure poplar and on right, nearly pure paper birch. The stands are 20 to 30 years old

stand had been burned at least three times. It suffered a light fire, mostly on the ridges, 20 years ago, and heavy fires 45 and 57 years ago. The stand probably originated from a fire between 75 and 80 years ago.

No sample plots were made in the coniferous swamp type. The species are cedar, balsam, black spruce, and tamarack, and they occur in various proportions, sometimes one species and sometimes another predominating. While such swamps are common throughout the area, they are most abundant and of largest extent in the northern tier of townships. These swamps occupy some 14,600 acres, or 66 per cent of the coniferous type. They are the chief source of supply of cedar poles.

The coniferous forest is practically cut clean in the process of lumbering. Very little remains to establish the future crop. For example, on a licensed lot in Anstruther an average of 30 mature white pine trees per acre had been removed. A strip half a chain wide and 20 chains long was run through the cutting, and on this area (2 acres) a careful search failed to disclose a young pine tree of any kind. A similar strip was made in a cutting of hemlock, and it was found that 93 hemlock trees per acre had been removed. To reproduce the hemlock, there were left 5 poles and 2 saplings. That is, where 93 trees were taken only 7 were left to establish a future crop, and the chances are that these will be blown down or burned. Cases like these might be multiplied indefinitely ; in fact, such is the usual condition on cut-over crown lands. There is no hope for a future supply, which must come from such cut-over lands. Another fact should be pointed out in this connection : it is the custom of the Government to consider revenues from cuttings like these as current receipts ; whereas, since forest lands so treated become non-productive and useless, they, in reality, represent money taken from the capital stock.

The Poplar-Birch Type

The most important type, because occupying the largest area, is the poplar-birch type, which is almost entirely the result of forest fires. It comprises 57.3 per cent of the forested area. It is not a permanent forest type but represents only the prelimininary stages in the replacement of the original forest. That is, this would be the natural process, were it not for the destructive and retarding influence of man's agency, through fires which, if repeated on the same area, eventually kill all seed trees of the original species and so prevent their re-establishment, or at least delay it to a very distant future. Where fire does not follow the cutting of the commercial species, or where only one fire follows, the young growth of the original species generally establishes itself, in the course of twenty or thirty years, in their former numerical quantities. When, however, repeated fires occur, resulting in the destruction of the seed trees, the young growth can invade the burned area only from the margins of the unburned forest. With pines it is only accidentally that seeds are deposited more than 200 or 300 feet from the mother tree, it would, therefore, require many generations of trees to advance the new growth of the commercial species across a burned area a mile wide. Areas of this size intervening between seed trees are very common on the old burns of the Trent valley. Therefore, to say nothing of the disastrous effects of repeated fires upon the humus content of the soil, repeated fires retard the natural re-establishment of valuable species in their original proportions by several hundred years.

The poplar-birch stands for the most part represent former pineries, and they occur in the thin soils of the crystalline limestones and the granitic rock, and upon the deeper soils of the sand plains and sand ridges. The composition of these stands was determined in detail in several representative places from township to township, with special reference to the reproduction of the commercial species.

Tudor.—The greater portion of Tudor township lying within the Trent watershed, some 14,400 acres, or 64 per cent of the area, was severely burned about 32 years ago. Various portions have been re-burned since, the most recent fire being in 1911. The most sterile conditions in this old burn are to be found along the crest of the rocky ridge on the Hastings road about four miles from the village of Millbridge, where not more than one-fourth of the area has soil of any kind, being composed of ridges and hillocks of great blocks of rock. The poorer sites are occupied by poplar saplings and poles at the rate of only 150 per acre. On better sites, paper birch occurs at the rate of 190, and sugar maple at the rate of 60 trees per acre, while, at the foot of slopes and in deep ravines, one finds pure maple stands having 170 saplings and 240 poles per acre. The only reproduction of coniferous species (balsam and cedar) is found around the margins of swamps and in some of the deeper ravines.

North of Horseshoe lake and Jordan lake, where the country is made up of low sandy or rocky ridges with swamps in the depressions, one finds on the burn of about 32 years ago on the average acre the following :

NUMBER OF TREES PER ACRE, OLD BURN, SANDY RIDGE

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Poplar..........	10	90	360	460	56.1
Sugar Maple.....	..	...	170	170	20.7
Paper Birch......	..	...	70	70	8.6
Hop Hornbeam...	..	...	50	50	7.3
Pin Cherry......	..	20	40	60	6.1
Balsam..........	..	...	10	10	1.2
Total.........	10	110	700	820	100.0
Per cent.......	1.2	13.4	85.4		

Number of Trees per Acre, Base of Slopes, Transitional to Swamps

Species—	Poles	Saplings	Total	Per cent
Poplar	110	540	650	51.5
Sugar Maple	...	340	340	27.0
Black Ash	20	90	110	8.7
Hop Hornbeam	...	60	60	4.8
Paper Birch	...	40	40	3.2
Juneberry	...	30	30	2.4
Pin Cherry	...	20	20	1.6
Elm	...	10	10	0.8
Total	130	1,130	1,260	100.0
Per cent	10.4	89.6		

If these figures may be considered as representative, it would appear that the number of trees per acre along the base is 60 per cent greater than along the top of the ridges ; *i.e.* the reproduction along the base of the ridges is more promising. There is practically no reproduction of coniferous species on this area except balsam. This, however, together with cedar, is plentiful in the moister situations. The stumps on the ridges disclose the fact that pine, now entirely absent, once occupied them at the rate of 60 trees to the acre.

In a thin strip next to the highway along the Hastings Road grants, however, second growth white pine may be found in sufficient numbers to indicate future commercial quantities. In the old burn to the eastward of Bass lake, one finds patches of good reproduction in lots 17 and 18 in the 17th concession, where the stand is of the following composition :

Number of Trees per Acre in an Old Burn, Gentle Slope

Species—	Poles	Saplings	Total	Per cent
Sugar Maple	30	460	490	40.2
White Pine	200	180	380	31.1
Paper Birch	90	40	130	10.7
Hop Hornbeam	..	130	130	10.7
Beech	..	40	40	3.3
Balsam	10	20	30	2.4
Cedar	..	20	20	1.6
Total	330	890	1,220	100.0
Per cent	27.1	72.9		

There were about 50 acres in this stand and, with the exception of a few small patches, this stand contained the only white pine reproduction discovered in travelling two miles through the old burn.

Limerick and Cashel.—North of Salmon lake and Devil lake in Limerick and Cashel, an old burn covers some 16,000 acres within the watershed and extends beyond it on the eastern and western sides. The area has been burned at least three times, 35, 20, and 10 years ago. A few patches of pine reproduction, however, appear to date from a fire 75 years ago. These were probably too small to be cut when the region was lumbered about 35 years ago, and escaped the subsequent fires. In order to determine what might be expected after 75 years on an area burned but once, sample plots were made in these stands with the following results.

Number of Trees per Acre on an Area Burned 75 Years Ago

Species—	Poles	Saplings	Total	Per cent
White Pine	180	20	200	55.6
Red Pine	80	...	80	22.2
Cedar	40	30	70	19.4
Yellow Birch	10	...	10	2.8
Total	310	50	360	100.0
Per cent	86.1	13.9		

The average diameter of 20 white pine in this stand was 6.7 inches and the average age 70 years, so the growth was 1 inch in diameter in 10.4 years. Balsam reproduction was abundant beneath the stand, in the densest portion yielding 109 to the square rod. They were not over four feet high and ranged between 12 and 19 years old.

The larger area was severely burned after the lumbering of about 35 years ago The difference in the character of the stands arising from that fire allows a differentiation into several well defined site classes, viz : the tops of the ridges, the base of slopes and the flats between the ridges—the latter being the best, the first the poorest as regards pine reproduction. Sample plots taken on these sites reveal the composition given in the three tables below.

Number of Trees per Acre, Top of Ridge

Species—	Poles	Saplings	Total	Per cent
Poplar	..	170	170	43.6
Paper Birch	20	80	100	25.6
White Pine	40	10	50	13.0
Pin Cherry	..	40	40	10.2
Red Pine	30	...	30	7.6
Total	90	300	390	100.0
Per cent	23.1	76.9		

Number of Trees per Acre at the Base of Slopes

Species—	Poles	Saplings	Total	Per cent
Poplar	10	170	180	37.5
White Pine	..	140	140	29.2
Balsam	..	90	90	18.7
Paper Birch	20	10	30	6.2
Red Pine	..	20	20	4.2
White Spruce	..	20	20	4.2
Total	30	450	480	100.0
Per cent	6.3	93.7		

Number of Trees per Acre on Flats between Ridges

Species—	Poles	Saplings	Total	Per cent
White Pine	100	170	270	55.1
Poplar	30	110	140	28.6
White Spruce	...	30	30	6.2
Paper Birch	...	20	20	4.1
Tamarack	...	10	10	2.0
Red Maple	...	10	10	2.0
Red Oak	...	10	10	2.0
Total	130	360	490	100.0
Per cent	26.6	73.4		

These plots represent patches which escaped a second fire that ran over the area 15 years later. The results of this later fire are their stands now 20 years old. Sample plots made in these indicate 250 poplar, 190 sugar maple, 20 pin cherry, 10 white pine and 10 red pine saplings per acre.

About 5,000 acres of the 16,000 acres were burned a third time 10 years ago and the result is a region of poplar and birch thickets, of hazel and bracken fern, with no reproduction of pine, although the skeletons of young trees indicate their former presence.

The old burn south of Salmon lake and Devil lake has apparently never been re-burned and its reproduction is excellent. There are frequent patches several acres in extent of red pine and white pine, and the general average of pine reproduction may be taken as that given in the tables above for the area burned only once. Along the southern shores of Salmon lake and in moist situations farther inland a thick undergrowth of balsam is found under the birch and poplar. This area of good reproduction of coniferous species covers about 6,000 acres.

Chandos.—An old burn in the northwestern portion of Chandos contains 7,800 acres and it extends over 2,500 acres in the adjoining township of Cardiff. The average age of the poplar now occupying the area is 26 years. Frequent pine seed trees remain, and as a whole the area is fairly re-stocked. The young growth exhibits a number of site classes, viz ; the higher ridges, (originally evidently covered by hardwoods with only scattering coniferous growth); the lower ridges, (originally covered with pine) ; the benches above the streams, and the immediate banks of the streams. Sample plots were made in these sites with the results given in the tables below.

NUMBER OF TREES PER ACRE ON THE HIGHER RIDGES

SPECIES—	Poles	Saplings	Total	Per cent
Sugar Maple	20	300	320	60.4
Poplar	60	30	90	17.0
Beech	...	30	30	5.6
Yellow Birch	...	30	30	5.6
Pin Cherry	10	10	20	3.7
Hop Hornbeam	20	...	20	3.7
Paper Birch	10	...	10	2.0
Ash	10	...	10	2.0
Total	130	400	530	100.0
Per cent	24.6	75.4		

NUMBER OF TREES PER ACRE ON THE LOWER RIDGES

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Poplar	10	100	490	600	76.1
Hop Hornbeam	..	...	80	80	10.1
Balsam	..	...	50	50	6.3
Elm	10	...	20	30	3.8
Paper Birch	..	...	20	20	2.5
Sugar Maple	10	...	...	10	1.2
Total	30	100	660	790	100.0
Per cent	3.8	12.7	83.5		

NUMBER OF TREES PER ACRE ON THE BENCHES

SPECIES—	Poles	Saplings	Total	Per cent
Balsam	..	280	280	45.8
Poplar	50	170	220	36.1
Cedar	..	80	80	13.1
Black Spruce	..	20	20	3.2
Juneberry	..	11	11	1.8
Total	50	561	611	100.0
Per cent	8.2	91.8		

NUMBER OF TREES PER ACRE ON THE STREAM BANKS

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Cedar	10	10	230	250	49
Poplar	..	110	120	230	45
White Spruce	..	...	20	20	4
Balsam	..	...	10	10	2
Total	10	120	380	510	100
Per cent	2.0	23.5	74.5		

These plots are fairly representative of the old burn in this region and it will be seen from them that the sugar maple is replacing itself in the probable original quantities (page 47) on its characteristic site. The low sandy ridge is the best site or poplar and here the stands closely approximate the average composition usually found in such situations. The best situations for the balsam are the benches or terraces from 10 to 20 feet above the streams, while the cedar predominates on the present erosion channels of the streams. The reproduction of white pine, however, is chiefly confined to the moist depressions between the ridges and to the edges of the swamps where occasional seed trees still stand. In the latter situation, on the average, 28 balsam and 16 white pine saplings and poles were found per acre. A sample strip a chain wide and 135 chains long (13.5 acres) over the ridges and through the depressions, disclosed 11 white pine saplings and poles per acre. Five acres of this strip, however, averaged 28 young pine trees to the acre. Here two seed trees per acre had been spared both by fire and by the lumberman. The greater reproduction in this case shows the wisdom of leaving a few seed trees.

Anstruther.—In the township of Anstruther nearly 35,000 acres, or 51.4 per cent. of the land area has been burned. A good portion has been burned three times, with the result that the originally thin soil overlying the granite ridges has been destroyed and the interior of the township, especially, very closely approaches desert conditions. The pine reproduction was counted on 50 acres, and it was found to average 8 pine saplings and poles per acre. The pine stumps from former cuttings average 80 per acre. No seed trees remain. If these 8 young trees are allowed to mature, then the repeated fires have reduced the potential value of the land in terms of pine by nine-tenths. North of this area a 20-acre plot revealed only one red pine and three white pine saplings per acre. A strip containing 12 acres west of the Twin lakes contained an average of 8.7 young pines per acre. These areas have been burned twice in the past 20 years and they were formerly pure pineries.

Around many of the lakes and in the ravines there are patches of second growth 30 years old, evidently arising from a fire, which show good reproduction of pine. For example, on the shores of Twin lakes in lots 30 and 31, in the 11th concession, there are, on an acre, 34 saplings and 54 poles of white pine, also 1 sapling and 4 poles of red pine. On the slopes rising from swamps and in the numerous deep gullies in this vicinity one finds dense thickets of balsam about 30 years old. One of these contained on an acre the following :

SPECIES—	Poles	Saplings	Total	Per cent
Balsam	155	1,625	1,780	73.4
Paper Birch	20	410	430	17.7
White Pine	30	55	85	3.5
Red Maple	15	30	45	1.9
Red Oak	20	15	35	1.5
Pin Cherry	5	15	20	0.8
Poplar	5	10	15	0.6
Red Pine	5	5	10	0.4
Black Spruce	0	5	5	0.2
Total	255	2,170	2,425	100.0
Per cent	10.6	89.4		

Along the margins of the mature forest an abundant reproduction of balsam is found beneath the old burn type, represented by seedlings and saplings, in many cases at the rate of 1,600 to the acre.

Some of the semi-barren ridges support considerable oak coppice but, under the present soil conditions, it probably will never become commercial, even though it should escape fire. Many of these ridges have already been burned four times in the past 30 years. On one of these, an acre showed 206 red oak, 60 paper birch, 40 white oak and 22 red maple saplings.

As a whole, not more than one-twentieth of the 35,000 acres of burned lands in Anstruther is reproducing the original pine in commercial quantities.

Burleigh.—Burleigh has 54,750 acres of burned areas—the largest amount within one township in the Trent watershed—and they represent 72 per cent of the land surface of the township. Much of the township has been burned three times, and some of it four times within the past 30 or 35 years. Like the interior of Anstruther, the interior of Burleigh is much like a desert. The reproduction after the various burns was studied in detail in the region lying between Eels brook and Jack lake. The oldest stand was approximately 30 years since the fire, the poplars being 27 years of age on the stump. It lies mostly in the ravines and protected pockets where it escaped the subsequent fires. Sample strips totalling 4 acres were run through these stands and the occurrence of the various species on the average acre is given below.

POLES AND SAPLINGS OF VARIOUS SPECIES ON AN AREA BURNED BUT ONCE: NUMBER OF TREES PER ACRE

SPECIES—	Trees	Per cent
Poplar	208.0	51.2
White Pine	62.2	15.3
Paper Birch	50.0	12.3
White Spruce	37.5	9.2
Balsam	29.5	7.3
Cedar	13.5	3.3
Red Pine	4.5	1.1
Tamarack	1.0	0.24
Hemlock	0.2	0.06
Total	406.4	100.00

Sample plots to the extent of 7.6 acres were made in a stand arising from a fire 20 years ago with the following results :

POLES AND SAPLINGS OF VARIOUS SPECIES ON AN AREA BURNED TWICE: NUMBER OF TREES PER ACRE

SPECIES—	Trees	Per cent
Poplar	320.0	71.3
Paper Birch	78.0	17.4
White Pine	19.0	4.3
Balsam	12.0	2.7
Cedar	11.4	2.5
White Spruce	4.0	0.9
Red Pine	3.2	0.7
Tamarack	0.9	0.2
Total	448.5	100.0

The areas burned three times, the last time 12 years ago, have the composition given in the table below.

POLES AND SAPLINGS OF VARIOUS SPECIES ON AN ACRE BURNED THREE TIMES : NUMBER OF TREES PER ACRE

(Average of 2.7 acres)

SPECIES—	Trees	Per cent
Poplar	328.0	46.8
Pin Cherry	125.0	17.9
Paper Birch	93.0	13.3
Red Maple	60.0	8.6
Willow	58.0	8.3
Red Oak	22.0	3.1
White Oak	3.4	0.50
White Spruce	2.2	0.31
Basswood	2.0	0.30
White Pine	1.8	0.25
Red Pine	1.8	0.25
Balsam	1.1	0.15
Elm	1.0	0.14
Cedar	0.7	0.10
Total	700.0	100.00

So far as could be discovered, the area burned the fourth time, in 1911, is without the possibility of pine reproduction, since all of the seed trees have been killed except an occasional one in the margin of a swamp.

Harvey.—In northeastern Harvey some 8,000 acres were burned over 40, 20, and 12 years ago. The last two fires ran only here and there, and second growth from the three fires may be found on the same area. A strip of 7.8 acres was made across the ridges and through the depressions with the following results :

NUMBER OF POLES AND SAPLINGS OF VARIOUS SPECIES PER ACRE
(Average of 7.8 acres)

SPECIES—	Trees	Per cent
Poplar	271.0	90.30
Paper Birch	16.0	5.32
White Pine	9.7	3.23
White Spruce	1.6	0.53
Cedar	1.0	0.30
Balsam	0.6	0.20
Hemlock	0.2	0.08
Black Spruce	0.1	0.04
Total	300.2	100.00

The coniferous species only were counted on 18 acres on a limestone plateau and the average per acre was found to be : white spruce, 25 ; tamarack, 13 ; cedar, 11.6 ; balsam, 7.8 ; white pine, 7.8 ; red pine, 5.4 ; black spruce, 0.8.

Galway.—With the exception of relatively small areas occupied by farms, the three northern concessions of Galway, about 14,000 acres in all, were burned 35 years ago. Judging from 36 acres of sample strips made in various places, the young pine averages 3.5 trees per acre. This was originally a pure pinery. Patches occur, however, where the reproduction is much better than this, especially on the moist flats, where sample plots amounting to five acres disclosed 27.2 white pine ; 11.6 hemlock ; 6.4 cedar ; 3.4 balsam ; and 0.4 tamarack poles and saplings per acre.

Cavendish.—Cavendish has 21,000 acres of burned lands, constituting 45 per cent of the township. In the northwestern corner the reproduction of coniferous species is very good. A sample strip consisting of 8.6 acres revealed 65 balsam, 18.3 cedar, 13.1 white pine, 8.1 white spruce, 3 hemlock, 2.9 tamarack, 0.9 black spruce and 0.3 red pine poles and saplings per acre. East of Pencil lake the region was burned 15 years ago, and 10 acres of sample strips showed 3.5 white pine and 1.3 red pine poles and saplings to the acre. The same area contained 66 pine stumps over a foot in diameter per acre.

Lutterworth.—Lutterworth township contains 29,000 acres—77.8 per cent of its area—of burned lands. Most of this was burned in 1881 and by far the greater portion is without reproduction of pine in commercial quantities. Two strips were run through the old burn in the southeastern portion of the township. One of 24 acres revealed young pine at the rate of 1.4 trees per acre ; the other of 29 acres disclosed one pine tree to every six acres. This region was formerly a pure pinery.

Methuen.—The township of Methuen has suffered severely from fires. Only 13 per cent of the land surface is covered by mature forest and the farms constitute only 2.6 per cent of the area of the township. The rest, 53,000 acres, is bush land, semi-barren and barren, owing to repeated fires.

The Blueberry 'barrens,' situated in the east central portion of the township, are the most severely burned areas and they cover some 9,400 acres. The area is composed of low granitic ridges with frequent swamps between them. The rock is in the last stages of decay, frequently crumbling between the fingers, and it yields a soil of gravel and coarse sand. The ridges probably originally supported trees only sparingly, owing to the dearth of soil, but the flats between the ridges have a soil of sufficient depth to support a forest, and that they can do so is shown by the presence of scattering red pine a foot or more in diameter. The fire scars on these trees tell the story of the barrens. They indicate that fires of an intensity sufficient severely to wound the trees occurred in 1836, 1853, 1865, 1874, 1882, 1897, and in 1911. The trees are 98 years old and they record fires at the rate of one every 14 years. The age of the young growth indicates several intermediate fires too small or too local to injure the larger trees.

The trees were counted on a strip 100 chains long and a chain wide across the barrens. The table below indicates the number of trees of various sizes and kinds on the 10 acres.

NUMBER OF TREES PER ACRE, METHUEN BARRENS

(Average of 10 acres)

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Poplar	....	0.85	25.45	25.35	57.4
Red Oak	0.1	1.80	7.15	9.00	20.2
White Oak	0.3	1.25	2.15	3.70	8.3
Jack Pine	....	....	2.65	2.65	5.9
Red Pine	0.2	0.55	0.70	1.45	3.2
White Pine	0.05	0.20	0.95	1.20	2.6
Paper Birch	....	0.10	0.45	0.55	1.2
Tamarack	....	....	0.35	0.35	0.7
Red Maple	0.05	0.25	.....	0.30	0.5
Total	0.70	5.00	38.85	44.55	100.0
Per cent	1.6	11.2	87.2		

As previously stated, the table above indicates the present composition and the size of the trees on an area which has been severely burned, in addition to numerous surface fires, occurring seven times in the past century. Occasional pockets which escaped the fires indicate what the forest might be now, were it not for the repeated fires. For example, sample strips were run through a patch of 5 acres which had apparently arisen from a fire about 30 years ago, but had escaped subsequent fires, owing to its position between a lake and a marsh. The composition of the stand is given below.

NUMBER OF TREES PER ACRE ON A LOW FLAT, METHUEN

(Average of 5 acres)

SPECIES—	Standards	Poles	Saplings	Total	Per cent
Red Pine	..	76	212	288	55.8
Poplar	4	102	52	158	30.6
White Pine	..	18	20	38	7.4
Paper Birch	..	4	18	22	4.3
Red Oak	..	6	2	8	1.5
Jack Pine	2	...	...	2	0.4
Total	6	206	304	516	100.0
Per cent	1.1	40.0	58.9		

The poplar and jack pine standards are remnants of the forest burned 30 years ago.

Another stand of about the same area, similarly protected from fire, was found on a dry gravelly knoll. A sample plot in it revealed the following composition.

NUMBER OF TREES PER ACRE ON A GRAVELLY KNOLL, METHUEN

(Average of 5 acres)

SPECIES—	Poles	Saplings	Total	Per cent
Poplar	40	70	110	56.7
Red Pine	18	44	62	32.0
Red Oak	4	8	12	6.2
White Pine	6	2	8	4.1
Paper Birch	2	..	2	1.0
Total	70	124	194	100.0
Per cent	36.1	63.9		

These two plots represent sites on which pines, if not burned, would grow in other portions of the barrens. Here, on ten acres, we find potentially commercial red pine at the rate of 35 trees, and white pine at the rate of 4.6 trees per acre. Comparing this with ten acres on the adjacent seven-times-burned area, as given in the third table above, we find there red pine at the rate of 1.4 trees and white pine at the rate of 1.2 trees per acre. In one case, 39.6 and in the other, 2.6 pine trees per acre. Thus, if we regard these sample plots as representing average conditions in the two cases, we see that repeated fires have reduced the commercial possibilities of one area, in terms of pine, by 15, or, stated the other way about, protection from fire for only 30 years has increased the commercial possibilities of one of the areas by 15.

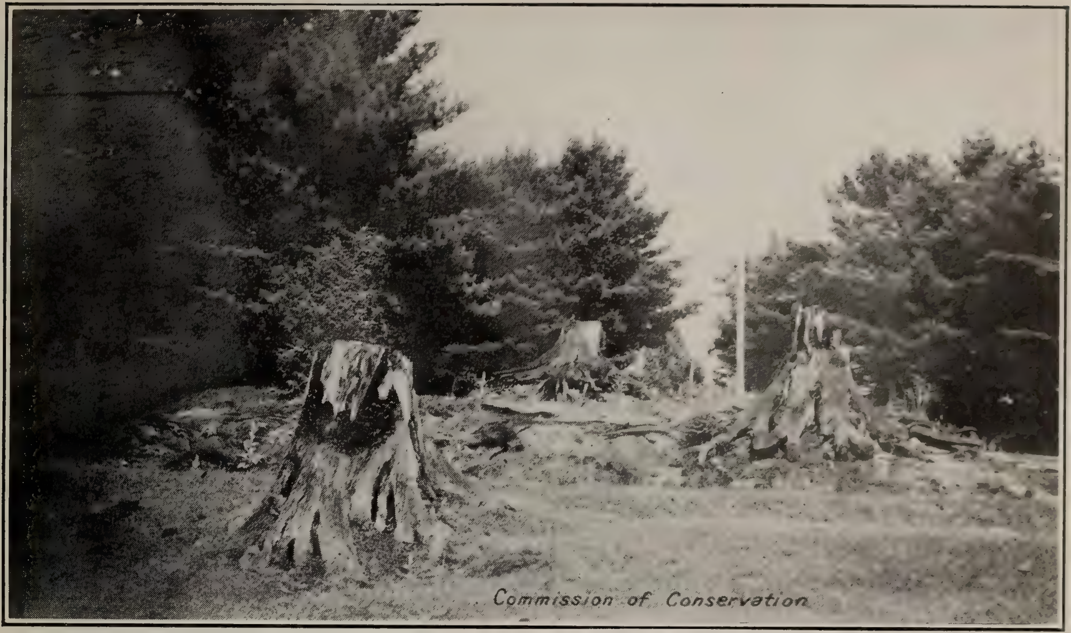
In addition to the barrens, 17,600 acres in Methuen were classified as without prospect of timber in commercial quantities unless planted. The whole of the area has been burned three times, and portions of it five times, since lumbering operations of about 30 years ago. The most severely burned portions are now thickets of poplar with scattered birch and oak, and are without reproduction of coniferous species. A sandy flat burned 16 years ago now has on the average acre, 20 poles and 174 saplings of trembling aspen ; 6 poles and 156 saplings of large-toothed aspen, and 66 saplings of paper birch. The composition percentage of these species in the order enumerated is 46.1, 38.3, and 15.6. On a rocky ridge burned ten years ago there were per acre the following number of saplings : large-toothed aspen, 580 (70.3 per cent) ; trembling aspen, 228 (27.6 per cent) ; red oak, 10 (1.2 per cent) ; white oak, 8 (0.9 per cent.)

The major portion of the area has been burned three times and it contains scattered reproduction of pine and other conifers. A strip 300 chains long was run through this in a direction more or less parallel with the ridges and the coniferous saplings and poles were counted. The average number of young conifers per acre on the 30 acres thus examined was as follows : red pine, 2.5 ; white pine, 1.5 ; jack pine, 1.4 ; tamarack, 0.3 ; hemlock, 0.1 ; balsam, 0.05 ; white spruce, 0.05. Another strip, a chain wide, comprising 40 acres, was run so as to cross the ridges and depressions and it was found to contain 292 young red pine and white pine. The 30-acre plot contained 120 young trees of these species, so the average of the 70 acres was 5.8 trees per acre. At the same time the stumps of the trees removed from the area were also counted. Those over a foot in diameter averaged 60 per acre. Therefore where 60 commercial trees were removed only 5.8 potentially commercial remain to take their place. The repeated fires have killed practically every seed tree, so this reduction in value in terms of pine is essentially permanent. Thus the lack of fire protection on these 17,600 acres, has resulted in a growth with a potential value of only one-tenth of the original forest.

In the northern portion of the township there are 7,500 acres that have been burned but once since lumbering. The stand is composed of the usual poplar and birch and the coniferous species are returning in commercial quantities. Balsam and white spruce are abundant in the ravines and in the moister situations. Sample plots reveal young pine at the rate of 25 trees per acre. Numerous seed trees remain so the area is all the time increasing its stock. In course of time, if not burned, the area will reproduce its original stock of pine.

Financial Losses by Forest Fires

In reading the preceding pages one is impressed by the action of repeated fires in retarding, and, in some cases, entirely destroying the reproduction of pine. Since the soil is fit only for the growing of trees and is especially adapted to pine, it is evident that any treatment involving a reduced future production of pine on such areas will result in considerable financial loss to the owner, in this case, the Crown. An attempt is made in the following pages to reach an approximation of these losses. For example, in the township of Cashel the first fire, of 35 years ago, doubtless left numerous seed trees which gave rise to the pine in the quantities indicated in the tables on pages 53 and 54. The second fire apparently ran over about three-fourths of the second growth resulting from the first fire, and killed most of the remaining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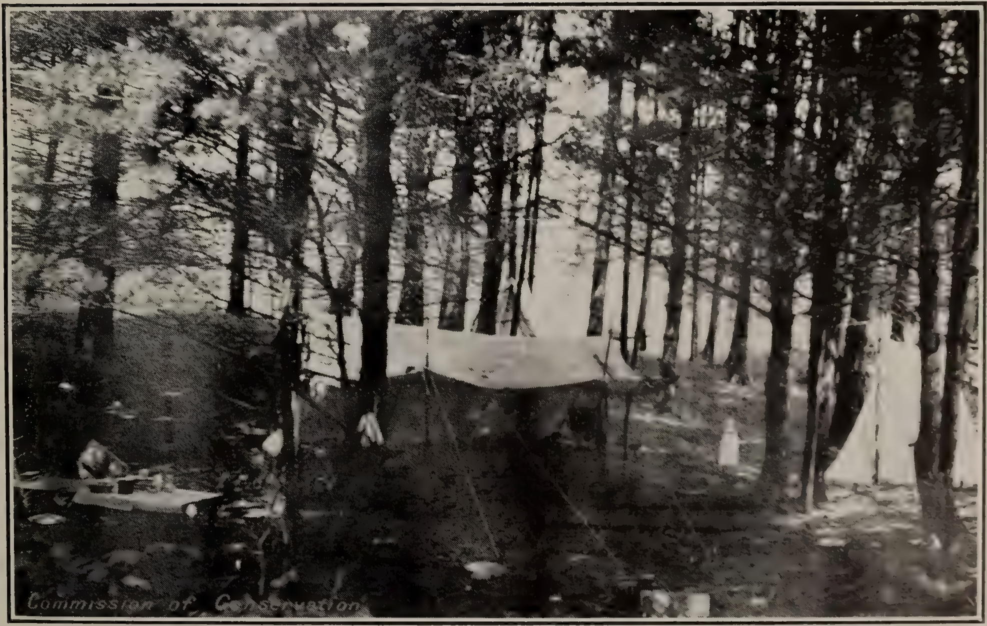
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WHERE SEED TREES WERE LEFT AFTER CUTTING AND WHERE NOT TOO SEVERELY BURNED, THE PINE IS REPRODUCING ITSELF IN COMMERCIAL QUANTITIES

This is taking place on 75,000 acres in the Trent Watershed

seed trees as one would infer from the numerous fire-killed rampikes scattered over the area. The third fire apparently killed the few seed trees that may have escaped the second fire. The average number of young pine trees per acre resulting from the first fire is 170, from the second fire 20, and from the last fire none. Regarding these plots as averages for the whole burned area and supposing that the 170 trees would have come to maturity and had yielded 100 board feet apiece, the average acre, if burned but once, would have yielded 17,000 board feet, upon which the dues accruing to the Crown at the present rate would be $34 per acre. The second fire reduced the potential dues to $4 per acre and the third fire eliminated them entirely. This is a striking illustration of the manner in which repeated fires reduce the future values of cut-over lands and it becomes all the more striking when the acreage involved is considered. If we deduct one-eighth of the area for the swamps, we have in Cashel about 14,000 acres of potential pine lands. If we suppose that this acreage had been burned but once and that the young pine occupied the whole area in the quantity indicated above, namely 170 trees per acre, and that the yield at maturity would be $34 in dues, then the potential dues would aggregate $476,000. At present, however, there are only 3,500 acres with 170 trees per acre and the dues on this would amount to $119,000. Besides this, there are 9,000 acres worth $4 an acre in dues according to the calculation above, total $36,000. Therefore, the potential dues on the 14,000 acres with its present stand of young pine amounts to $155,000, when, if it had been burned but once, they might have amounted to $476,000. Or, in other words, the repeated fires on one area alone have cost the Government $321,000 in potential dues alone.

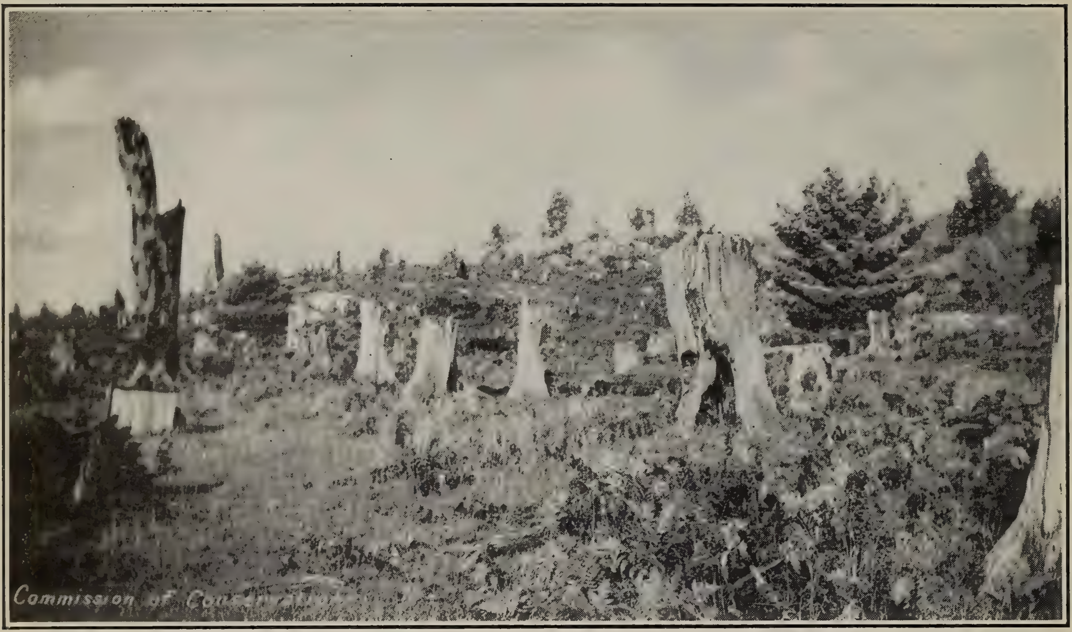
By referring to the tables of reproduction in Burleigh on page 57, it will be seen that the area burned but once now contains, per acre, 148 trees of the various commercial species that will eventually produce saw-logs. The second fire reduced this number to 50, the third to 36, and the fourth to nothing. Disregarding the other species and taking the red pine and white pine alone, it is seen that the area burned only once, now averages 66 trees, that burned twice 32, and that burned three times only 4 trees per acre. Assuming that these pine trees escape future fires and at maturity yield 100 board feet apiece, we find that the first area would be worth $13.20 per acre in dues. The second fire reduced the potential dues to $6.40 per acre ; the third fire to 60 cents, and the fourth fire wiped out the 60 cents. Unfortunately the extent of the burns 30, 20 and 12 years ago was not determined, otherwise these sums might be multiplied into the acreage in each case and the loss in potential dues in the whole township might be thus estimated. The area of the fourth fire, however, is 6,000 acres in Burleigh and 1,000 acres in adjacent Anstruther. If we assume that, had the area been burned but once, it would have produced pine at the same rate as that given above in the once-burned, 30-year-old stand, then the three subsequent fires on this 7,000 acres have cost the Province $92,400 in potential dues.

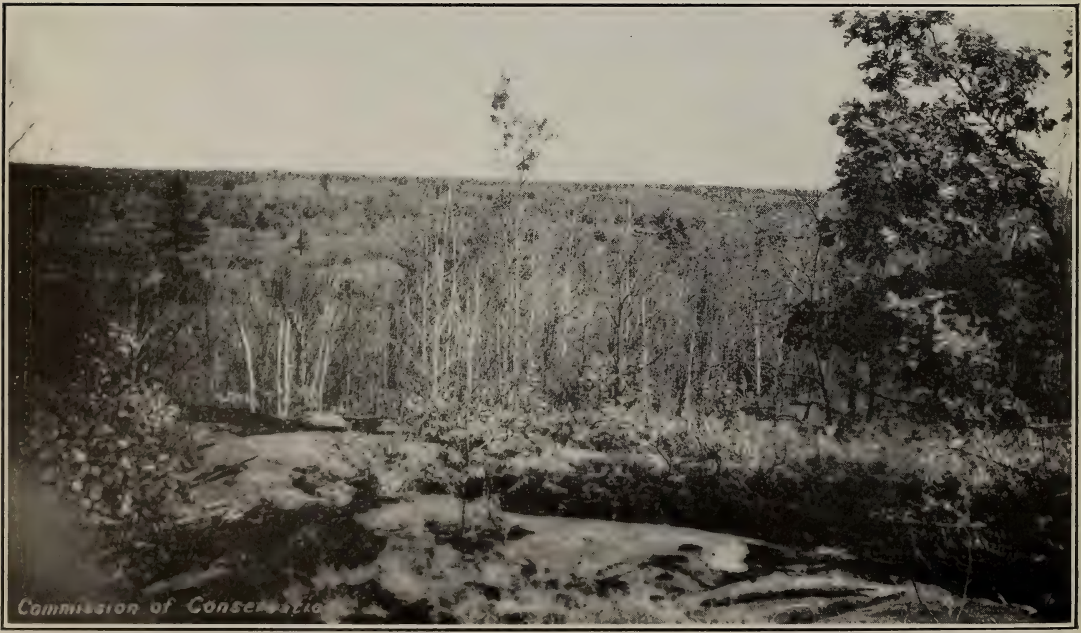
Methuen offers an excellent opportunity to study the effects of repeated fires upon the reproduction of pine. Here, areas burned but once now have 30 poles and saplings per acre ; those burned three times 5.8 and those burned eight times 1.7 young pine trees per acre. This dep,reciation in value may be stated in dollars. Supposing that the original pinery on these areas contained 60 trees over a foot in diameter per acre and that each tree yielded 150 board feet, then the stand contained 9,000 board feet per acre. At the present time the Government would receive $18 per acre in dues alone for this. The area burned but once now contains 30 trees per acre, which with the estimate above would yield at maturity $6 per acre in dues. By the same calculation the area burned three times would be worth at maturity $1.80 and that burned eight times 30 cents per acre in dues. Considering the acreage in each class we can make the following calculation :

7,500 Acres Burned Once.		
Value of dues if fully stocked (60 trees per acre)	$135,000	
Potential value of dues with present stock (30 trees per acre)	45,000	
Loss by one fire		$90,000
17,600 Acres Burned Three Times.		
Value of dues if fully stocked (60 trees per acre)	$316,800	
Potential value of dues with present stock (5.8 trees per acre)	31,680	
Loss by three fires		285,120
9,400 Acres Burned Eight Times.		
Value of dues if fully stocked (60 trees per acre)	169,200	
Potential value of dues with present stock (1.7 trees per acre)	2,820	
Loss by eight fires		166,380
Total Loss in Potential Dues by repeated Fires on 34,500 Acres		$541,500

The $541,500 represents simply the loss in potential dues. It includes neither the potential stumpage value of the timber nor its value to the community in preparing the timber for market.

The tables on pages 21—26 show that 560,500 acres of the 1,345,500 acres included in this report were classified as young growth and second growth of the poplar-birch type after fires. Besides these, 37,300 acres were classed as barrens and semi-barrens due to repeated fires. The recent burns amount to over 22,500 acres. These make a total of 620,000 acres which have been burned, or 46 per cent of the entire area. The rate


Commission of Conservation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FORMER PINERIES
A few seed trees remain, but not enough to re-establish the crop on a commercial basis. 389,000 acres in this condition in the Trent Watershed

of pine reproduction on the old burns was actually determined by counts on over 500 acres of sample area scattered through the various townships. This was done by running long strips, usually a chain wide, so as to approach as nearly as possible the average conditions, and by counting the trees on such areas. Besides these actual measurements, mental calculations in regard to reproduction were constantly made when passing through the old burns. As a result of these studies the burned areas may be classified with reference to the number of times burned and the amount of pine reproduction. These are shown in the table below, together with an estimate of what the repeated fires mean in terms of loss in potential dues by retarding or destroying the replacement of pine. The areas of the former pinery burned only once, now average 30 young pines per acre, and this, rather than the number of trees in the original stand, is taken as the basis of the calculations given below. It is assumed that each tree now standing will mature and, at maturity, will yield 100 board feet, or, in other words, since the once burned areas average 30 young pine per acre, 3,000 board feet per acre is regarded as the expected yield ; a moderate estimate, when compared with the original yield of these pineries, which cannot have been less than three to four times as large. The stumpage value is regarded as $7 per M and the dues are reckoned on the present basis of $2 per M.

Pine Reproduction on Burned Areas with Estimates of its Value and the Loss in its Value by Repeated Fires

—	Burned once Average 30 young pine trees per acre	Burned two to three times Average 6 young pine trees per acre	Burned four to eight times. No reproduction of pine	
Acres	75,000	389,000	156,000	
Potential value of dues if burned but once	$450,000	$2,334,000	$936,000	
Potential value of dues with present stock	450,000	466,800	Nil	
Loss of dues by repeated fires	....	1,867,200	936,000	
Potential stumpage value if burned but once	1,575,000	8,169,000	3,276,000	
Potential stumpage value of the present stock	1,575,000	1,624,000	Nil	
Loss of stumpage values by repeated fires	....	6,545,000	3,276,000	
Total loss in potential dues	....	....	....	$2,803,200
Total loss in potential stumpage value	....	....	....	9,821,000
Grand total	....	....	....	$12,624,200

From the above it will be seen that the total loss in dues and stumpage under our assumptions is $12,624,200. This sum, of course, must be offset by the value of the second growth, which, in this case, is principally poplar. The aggregate of sample strips taken in poplar stands from 20 to 35 years old was 56 acres. The average number of poplar trees per acre on these 56 acres was 250. On some 300 poplar stumps, in all, the annual rings were counted and diameters measured in the various townships. Their average age was found to be 32.23 years and their average diameter 6.28 inches. From the volume tables of poplar we find that it takes 33 trees, 6 inches in diameter and 50 feet high, to make a cord of peeled pulpwood. If we regard 250 trees per acre as the average for the entire area and apply the above factor, we find that the average acre, in its present condition, would eventually yield 7.5 cords of pulpwood. Regarding poplar pulpwood as worth $1.00 per cord on the stump, then its value on the 560,000 acres at 32 years of age would be $4,200,000. In other words, referring to the figures above in regard to the pine, the fires destroyed $12,600,000 worth of pine and replaced it by $4,200,000 worth of poplar, thus leaving $8,400,000 still to charge to the fire account. As sufficient data to give these figures scientific accuracy is lacking, they must be regarded simply as approximations, but there is no doubt respecting the great financial loss both in the quantity and quality of the forest products through the agency of fires. It is very desirable that extensive studies be made upon these old burns in order to determine as nearly as possible the actual and potential decrease in value as the result of successive fires. If data of this kind could be prepared and given wide circulation it would lead to a greater appreciation of the value of the second growth and so help to make the public more cautious in regard to fires. At present there is a widespread belief in the public mind, that a fire in second growth does no particular harm, because it does not destroy saw-logs. The people forget, or perhaps do not realize, that from these burned-over lands must come our future supply of pine —if we are to have a future supply ; that there can be no saw-logs when the mature trees are once removed, if their young, the future producers, are killed by periodic fires.

Fire Protection

The discussion on the previous pages naturally leads to a consideration of fire protection in the Trent watershed. It is apparent, from the summer's observation in the field, that the areas containing merchantable timber are thoroughly and efficiently protected. It is, of course, to the limit-holder's interest to do this, and his interest extends to the cut-over and burned-over portions of his limits only so far as fire in them might endanger his standing timber. The other portions are entirely neglected, and since the recent change in the fire protection regulations of the Province has thrown the entire cost of protection upon the limitholder, it is only natural that this should be so. Most of the limit-holders cutting pine will finish their operations in a few years. (One of the largest limit-holders expects to clean up all his remaining merchantable pine in four years.) Under such circumstances,the limit-holder feels under no obligation to pay for the protection of young growth which will soon automatically revert to the Crown. So far as could be ascertained, the limits which have already reverted to the Crown in the region are not protected by the Provincial authorities. The result of these circumstances is that *over 560,000 acres of potentially merchantable timber are without fire protection.* From the table on page 63 it will be found that the area contains enough pine, if allowed to come to maturity, to be worth $4,115,800 at the present dues and present stumpage value. A like rough estimate gives the stumpage value of poplar for pulpwood on the same area as $4,200,000. To an unprejudiced observer, it would seem worth while to attempt to save property whose potential value at present prices is $8,315,800, to say nothing of its value to the community in transforming that value of raw products into finished products.

The preceding statement is made on the assumption, that, if the area is not protected from fire, the young timber will never come to maturity, an assumption amply justified by the past history of the area. The old pineries, with the exception of those in one township, have suffered at least three extensive fires in the past 35 or 40 years. Within the same period, many have had four severe fires, and others five. As a whole, 560,000 acres have been burned in the past 40 years. This is at the rate of 14,000 acres burned yearly. As only the portions where they killed standing timber or advanced second growth are indicated, the map accompanying this report does not give the actual extent of the recent fires. Surface fires were not included. Most of the lands classed as barrens have been burned in the past four years, the time limit of *recent* burns. The *recent* burns and the barrens total 60,000 acres. This means that the average yearly rate of 14,000 acres, for the past 40 years has been maintained in recent years. Therefore it is evident that there has been no appreciable diminution in the occurrence of fires in this region. Moreover, as the young growth gets older, as the dead leaves and litter accumulate on the ground, and especially as the resinous trees will occupy, relatively, more space, there will be more material for the fires to feed upon and the danger of destructive fires will materially increase.

The region could be effectively protected from fire with a small outlay of money in proportion to the value of the property involved. The topography of the country affords numerous excellent sites for look-out stations, and the numerous rural telephone lines would render very effective assistance.

The following places are suggested as good points for such look-out stations : a point between Devil lake and Dixon lake commands a view of the major portion of Cashel within the watershed, and the eastern portion of Limerick. It is 8 miles from the telephone at St. Ola and 2 miles from a farmhouse where the look-out man could stay. The diorite ridge in Tudor on the Hastings road drops off in a sheer precipice 200 feet or more. A tower 30 feet high on the edge of this bluff would give a view of the greater portion of the townships of Tudor and Lake. The village of Millbridge, with a telephone line, is about four miles distant and there are farmhouses within two miles.

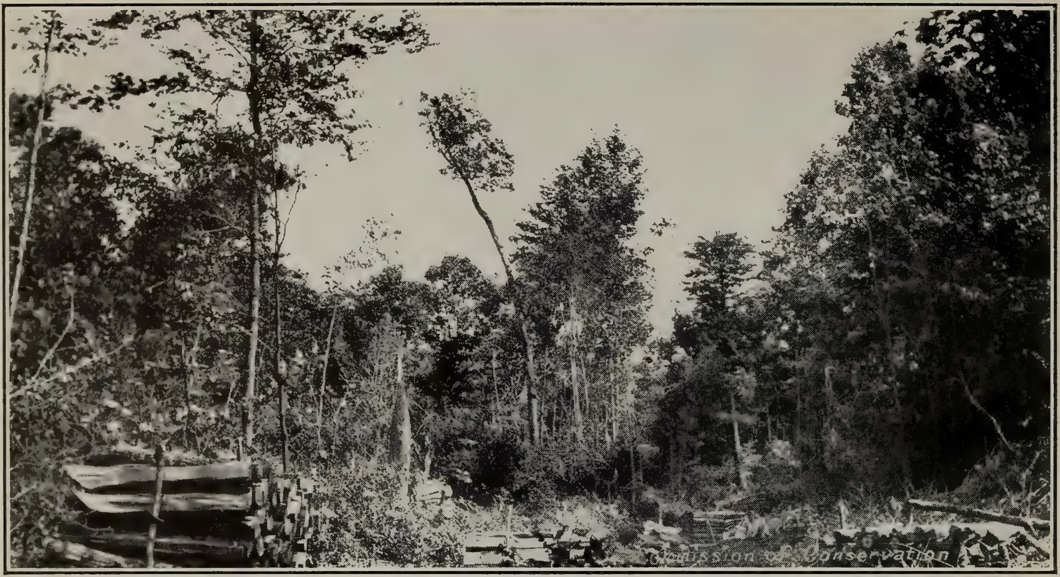
A sub-station might be established on 'The Ridge' in the south central portion of Wollaston. This is a farming area and a farmer could be employed. Any one of the several farmers on the ridge could, from his farm, see the southern half of Wollaston, the northwestern portion of Lake, and portions of Limerick and Chandos. In the northeastern corner of Wollaston are some high hills which command a view of northern Wollaston, northwestern Limerick and southern Faraday. Here, a look-out station could be constructed within two miles of a farmhouse, and could be connected with the telephone at Coehill, a distance of four miles.

The Green mountains in southern Glamorgan are 250 feet above the general level and present a view which covers the southern half of Glamorgan and Monmouth and the northern portions of Cavendish and Anstruther. They are within two miles of farms and could be connected by telephone with Gooderham, four miles distant.

From the Blue mountains in the west central portion of Methuen, one can see practically the whole of that township, as well as the western portion of Lake, the eastern portion of Burleigh, and the southeastern portion of Anstruther. The hills are within four miles of a farmhouse and within 8 miles of Apsley, the nearest telephone connection.

In lot 22, concession VIII, of Harvey, there is a high point which commands a view of the eastern portion of that township and the western portion of Burleigh, besides part of southern Cavendish. In a straight line, it is 5 miles from the nearest telephone connection at Hall Bridge.

About a mile and a half east of Bass lake in Galway, a knob rises about 200 feet above the general level, and, from its summit, one can see all the southern half of the township, the northeastern portion of Har-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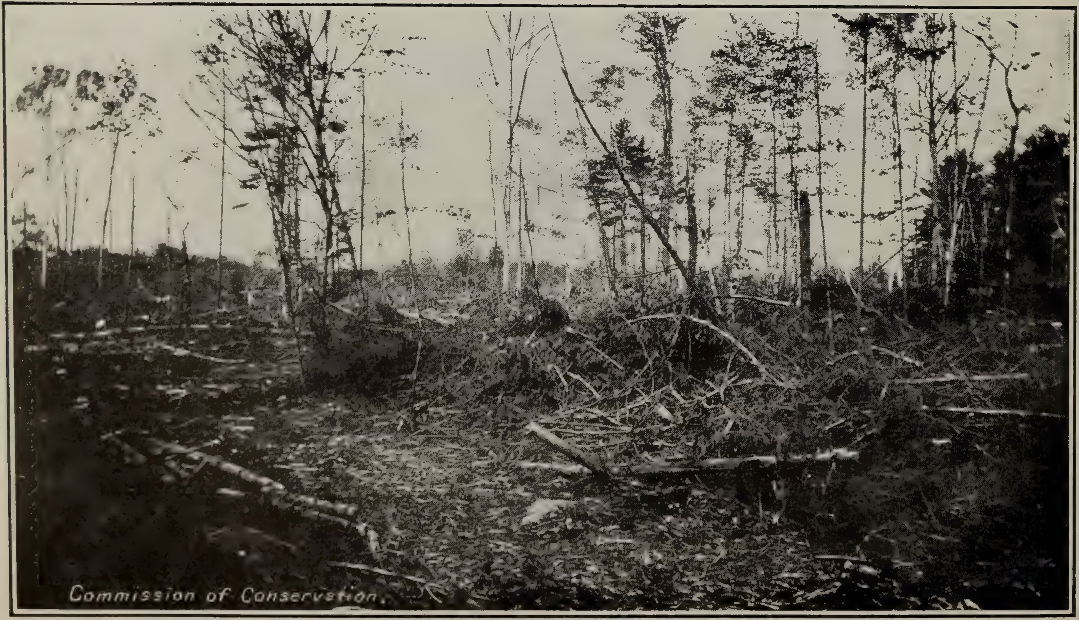
CUTTING IN A HARDWOOD FOREST: LITTLE DANGER OF FIRE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CUTTING IN A PINE FOREST: MUCH INFLAMMABLE MATERIAL ON GROUND vey and southwestern Cavendish. At its base is an abandoned farmhouse where the station keeper might live during the summer. A telephone line could be run to tap the one along the Bobcaygeon road about 4 miles to the westward.

Three other look-out stations should be established ; one, near the boundary of Glamorgan and Snowdon, about midway between the two railways, to control the large burned-over areas in the adjoining portions of these two townships; a second, in northern Somerville or southern Lutterworth to protect the extensive areas of second growth in that region ; a third should be in northern Lutterworth somewhere between Little Bob lake and Deer bay of Gull lake. There are favourable points in the last three places mentioned, but the writer is not sufficiently familiar with the topography to locate them exactly.

Twelve look-out stations located as indicated above would cover practically all the old pinery area now occupied by second-growth poplar and pine. Connecting these points with the nearest telephone lines would enable the look-out keeper to summon help from the neighbouring villages to fight the fire. The territory is well supplied with logging trails and cadge roads, and, except for the bridges, which are now generally broken down, these roads could be made passable at a relatively small cost. The great point in fighting fire is to get the men on the spot at its inception. So far as means of quick transportation are concerned, the region, as a whole, is remarkably accessible.

The game-wardens should be made firewardens as well, and with police powers, especially with power to summon men to fight fire at a fixed rate per diem. The tourists, campers, and sportsmen who enter the region should be required to register with the fire warden nearest their point of entry, giving him their probable routes of travel, camp sites and length of stay. Many of the fires are started by settlers burning brush. They should be made responsible to the fire warden for doing this at the proper time. The country adjacent to the three railways has been thoroughly burned. These railways should be required to take precautions in regard to fires and, if necessary, to patrol their lines during the summer months. To increase the efficiency of the system an inspector should be provided.

If measures like those indicated above could be efficiently enforced, disastrous fires in the Trent watershed would be reduced to a minimum, and this at a cost that would not be prohibitive, considering the value of the property thus protected. A rough estimate of the cost may be given :

40 miles of telephone lines ; materials and installation	$2,400
Building towers and shelters for look-out keepers	1,200
12 field glasses for look-out keepers	300
Salaries of 12 look-out keepers ; 5 months at $60 per month	3,600
Salary of an inspector	1,800
Annual cost of fighting fires and incidentals	700
Total	$10,000

On the 75,000 acres referred to on page 63 some of the poplar is already near merchantable size. Cuttings should be made in this for pulpwood within ten years. On the greater portion of the area, however, the poplar will not be ready for cutting before 25 years. Assuming it would be 25 years before the cuttings could be on sufficiently large scale to pay off the debt of previous fire protection, the sums given above at 4 per cent compound interest for 25 years would attain the following values :

$3,900 initial cost, 25 years at 4 per cent	$ 10,396.60
$5,400, salaries annually, 25 years at 4 per cent	224,887.85
$700, fire-fighting, annually, 25 years at 4 per cent	29,152.15
Total	$264,436.60

By spending approximately a quarter million dollars distributed over a period of 25 years the Government would have at the end of the period poplar alone worth $4,200,000 : in addition to this, pine at maturity worth $4,115,800 in dues and stumpage, at the present rates. It would be a very profitable transaction even at the present prices. From the facts stated in the previous pages, namely, that the average rate of 14,000 acres burned yearly in the past 40 years is still being maintained, and that the cut-over lands are now without fire protection, it is reasonably certain that the 560,000 acres under consideration will be without commercially valuable timber at the end of the next 25-year period unless an adequate system of fire protection is installed. No Government can afford to allow this amount of forest land to remain continuously unproductive.

III. A Brief Description of Conditions by Townships

Hastings County

Marmora Township

Watersheds.—About 70 square miles in Marmora township drain into the Trent canal by the way of Beaver creek and its tributaries. The remaining portion of the township is drained by Moira river. The portion of Crow lake lying in Marmora has a surface area of nearly 2,000 acres. The only lakes lying entirely within the township are the Twin Sisters, and they have hardly 200 acres of surface.

Topography.—The portion of Marmora drained by Beaver creek is a series of broad, flat plateaus and ridges, which increase in ruggedness in going northward. A fairly continuous ridge, extending across the township in a northeast-southwest direction separates the waters of the Beaver from those of the Moira. Another ridge runs from the northern side of Crow lake in a northeasterly direction and meets the watershed ridge near the centre of the township. Spurs from these two main ridges divide the lesser streams and form rounded hills and knolls. The remaining portion of the township has the appearance of a moderately dissected plateau on which the drainage is feeble, and consequently swamps are numerous. These vary in size from little pockets in the limestone to one containing 700 acres.

Rock and Soil.—The plateaus and broader ridges are underlain by limestone, while the sharper ridges represent intrusions of hornblende and gneissic rock through the limestone. In the northwestern corner of the township these intrusions have vertical strata forming sharp crested ridges with precipitous slopes, and the region between the slopes, not occupied by swamps, is strewn with broken fragments of rock. Portions of the limestone plateaus are also covered with boulders.

Forest Conditions.—The forest occupies 73.8 per cent of the township. The plateau area south of Crow lake, the region between Bronson creek and Beaver creek, and the ridges in the northwestern portion of the township were originally pineries. The pines have been removed and, as a whole, their reproduction is scanty. This comprises 13.4 per cent of the area and is now covered with the poplar-birch type. The greater portion of the township was, and still is, covered by the hardwood type, in which maple and beech are dominant, with scattering basswood, ash, elm, and hemlock. This type is represented chiefly by farm wood-lots and covers 48 per cent of the area. The numerous swamps, containing black ash, elm, balsam, black spruce, and cedar, occupy 12.1 per cent of the area. The pine-coniferous type is very restricted, only 0.2 per cent. Recent fires have also been practically absent, burning only 0.1 per cent of the area.

Lake Township

Watersheds.—The drainage of Lake township is about equally divided between Beaver creek and Deer river, whose waters fall into Crow river, which, in turn, flows into the Trent canal. The township has 2,600 acres of water surface, the aggregate of a dozen and a half of lakes. The largest lakes are Tangamong, Trout, Whetstone, Dickey Islands, Clear, Jack, and Copeway, in the northern portion of the township.

Topography.—The streams are separated by broad rounded ridges, and they are the highest and the most precipitous on the diorite outcrop along the Hastings road. While not so elevated, the country is very rough in the northwestern portion of the township around Tangamong and Copeway lakes. The rest of the township, with the exception of scattered, steep-bluffed hills, has the usual low ridges characteristic of the Archæan.

Rock and Soil.—The rocks covering the greater area are hornblende-schist and crystalline limestone. There are three large intrusions of volcanic rock through them. The largest of these is two miles wide and extends northeastward, from Mud Turtle lake ; another, in the same direction from Whetstone lake, and still another from Tangamong lake. The Tudor intrusion of diorite extends four miles in a westerly direction into the township. Copeway lake lies in an outcrop of massive granite and there is a patch of sedimentary limestone in the southwestern corner near Vansickle post office.

The eastern portion of the township is deeply covered with glacial drift soil of sandy loam, which, however, is filled with pebbles and stones. The soils of the western half are much thinner, more sandy, and, in many places, the bare rock is exposed.

Forest Conditions.—The prevailing forest type of the township is hardwood, with sugar maple as the most abundant species, this and beech making up three-fourths of the stand. The minor species are basswood, hemlock, elm, and ash. While the more valuable hardwoods have been removed, the cutting has not been sufficient to break the crown cover, so that the eastern portion of the township, especially, appears as an unbroken forest. A strip of the same nature extends half way down the western side from the north. This type occupies 56.4 per cent of the area. Between the hardwood areas there is a belt of the poplar-birch-old burn type, which comprises 38.6 per cent of the township. Around the lakes in the northeastern corner, there is considerable intermixture of hemlock and pine, but the mixed type, as a whole, covers only 1.4 per cent of the area. The pure coniferous type is practically lacking. One and one-half per cent of the area was burned in 1911.

Tudor Township

Watersheds.—Only the northern and western portions of this township, some 35 square miles, drain to Beaver creek, and thence to the canal waters, the remaining portion draining to the Moira river. Tudor has only 800 acres of water surface within the Trent watershed, the largest body being Horseshoe lake near Glanmire.

Topography.—The most conspicuous feature of the township is the diorite ridge entering Tudor from Lake township in Hastings Road lots 46 to 57, and extending eastward to lot 12, concession XI.

The ridge rises abruptly on the southern side, often in precipitous cliffs between 300 and 400 feet above the general level of the country ; on the northern side the slope is less abrupt. South of this diorite ridge the topography has little relief, while to the northward the country consists of low ridges 50 to 100 feet above the general level. The most pronounced of these ridges extends in a northeasterly and southwesterly direction along the northern side of Beaver creek to Bass lake.

Rock and Soil.—The rock on the diorite ridge is very near the surface, much of the area along the crest being entirely exposed or strewn with boulders, and there is not even sufficient soil for normal tree growth. North of this ridge the region is underlain by amphibolite and limestone with amphibolite intrusions. Through these at several places, especially at Glanmire, southeast of Bass lake, and at the township line south of St. Ola protrude low rounded bosses of massive granite. The amphibolite is micaceous, erodes with difficulty and makes a thin, sandy soil when eroded. The limestone is siliceous and also gives rise to a similar soil.

Forest Conditions.—The portion of Tudor township within the Trent watershed is forested to the extent of 88 per cent of its area. Most of this was originally pine land and is now covered with poplar and birch from 20 to 40 years old.* This type extends over 64.3 per cent of the area. The hardwoods, covering 14.3 per cent of the area, have been culled of the more valuable species such as basswood, elm, ash, and, to a certain extent, hemlock. Only about 800 acres were classed as semi-virgin, and they lie near Horseshoe lake. The mixed coniferous-hardwood type occupies 5.7 per cent, and the pure conifer type 1.2 per cent of the area. The latter is found in the swamps, since only small patches of pure second growth pine remain.

Along the Hastings road on the summit and northern slope of the diorite ridge, are some 600 acres which were burned about ten years ago, as well as an area of equal size in the northeast portion of the township which was burned six years ago. The greater portion of the territory south of Horseshoe lake, about ten square miles, was run over by a surface fire last year. The recent fires ran over 1.1 per cent of the area.

Limerick Township

Watersheds.—Of the 80 square miles of the township of Limerick, 47 square miles are drained by Beaver creek and 20 square miles by Deer river into the Trent canal, while the remaining portion drains northeastward by the York river into the Ottawa. The township contains 3,000 acres of water surface, one-half of which is contained in Salmon lake, the largest body of water.

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*See page 52.

Topography.—The whole township has the appearance of a dissected plateau with no high elevations. The more rugged portions are in the northern portion of the township.

Rock and Soil.—The rocks are about equally divided in area between hornblende schists and crystalline limestones mixed with amphibolite. There are outcrops of diorite along the western border south of Ormsby and south of Salmon lake. The strata is tilted and much of it is vertical. Outcropping ledges of rock are more abundant and the soil is thinner than in the townships to the southward. In many places it is not over six inches deep, the deepest upland soil covering the rocks by not more than 18 inches.

Forest Conditions.—About one-third (32.7 per cent) of the township is covered by mature forest and 12 per cent is under cultivation. The mature forest is mostly of the pure hardwood type, which covers 22.1 per cent of the area. The best stands of this type are found north of Salmon lake, where about 2,000 acres have been only slightly culled. The remaining 6,000 acres is severely culled or is second growth arising from clean cutting. Eight per cent of the area is a mixed forest occupying the wetter situations and 2.6 per cent is of the coniferous swamp type. The old pineries occupy 45.5 per cent of the area and are now of the poplar-birch type, in which there are patches of excellent pine and balsam reproduction.* Nearly 4,000 acres, or 9.7 per cent of the area, were burned over in 1911.

Cashel Township

Watersheds.—The portion of Cashel under consideration, about 35 square miles of the western part, is drained by the headwaters of Beaver creek. It contains 1,400 acres of water surface, mostly in Little Salmon and Devil lakes.

Topography.—A well defined ridge separates Beaver creek from the waters flowing eastward. Another ridge extends northeastward from Little Salmon lake until it reaches the main ridge in concession XI. These ridges are about 200 feet above the level of the lake. Numerous small streams divide the spurs of these ridges into many small hills, resulting in a diversified topography.

Rock and Soil.—The rock and soil conditions are of the same nature as those already described for Limerick.

Forest Conditions.—The ridges mentioned above are capped with hardwoods, which, for the most part, have not been severely culled. These cover 26.8 per cent of the area. The remaining portion of the mature forest is 2 per cent of the mixed type and 3.7 per cent of the pure coniferous type. The region north of Little Salmon lake was once covered principally with pine, but has suffered at least three severe fires in the past thirty-five years. Various escaped patches, especially around Devil lake, show excellent pine reproductions. The old burn type occupies 60.9 per cent of the area.

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*See pages 53 and 54.

Wollaston Township

Watersheds.—The southeastern portion of the township to the extent of some 8 square miles is drained by a stream that falls into Dickey lake and forms the headwaters of the Otter branch of Beaver creek, while the remainder, with the exception of three square miles in the northeastern part which drains into the York river, is drained by Deer river, one of the tributaries of Crow river. Eagle lake, containing some 600 acres, is the largest body of water. Extensive swamps are frequent.

Topography.—The township contains a series of ridges running in a northeasterly and southwesterly direction. The Ormsby-Coehill-Glenalda road, which runs through the centre of the township, traverses six main ridges, having an elevation of about 200 feet above the streams. To the northward the elevation increases to the height-of-land in Faraday township ; southward the ridges are of the same general elevation, with the exception of the ridge separating Deer river and Beaver creek waters, which is between 400 and 500 feet above the streams.

Rock and Soil.—About two-thirds of the township is underlain by limestone with amphibolite intrusions. There are diorite outcrops in the southeastern and northeastern portions of the township, granite in the southern portion, gneissic rocks in the southwestern and west-central portions, and a small area of syenite near Coehill. The granite outcrops, especially along the line of contact with the other rocks, are almost entirely lacking soil. A belt of sand, approximately a mile wide, extends across the centre of the township from east to west. The soil on the limestone is, for the most part, thin and sandy. Where deeper, it has a bed of boulders and pebbles for subsoil.

Forest Conditions.—Somewhat more than 80 per cent of Wollaston is forested. With the exception of the sand belt and the granite areas, the township was originally covered with hardwoods, which, as usual, are chiefly composed of sugar maple and beech. This type makes up 42.6 per cent of the area. It has not been culled as severely as most of the southern tier of townships, and nearly half of it was classed as semi-virgin. Approximately 14 per cent of the area is swampy, and much of the lumber industry is concerned in harvesting cedar poles from the swamps. The mixed type, mostly swamps, comprises 5.7 per cent, and the pure coniferous type—all swamps—covers 8.5 per cent of the area. Approximately one-quarter of the township is now in possession of poplar and birch, the area of the former pineries.

Faraday Township

Watersheds.—The western half of the township or approximately 45 square miles, drains into Deer river by the way of Pandash brook, and thence by way of Crow river into the Trent waters. The waters of the eastern portion of the township flow into the York river. Small lakes are numerous, but the largest has an area of less than 300 acres.

Topography.—The numerous ridges are all approximately the same height until the northern part of the township is reached, where the granite outcrops extend from 50 to 100 feet higher than the limestone ridges to the southward. The slopes are steep, often precipitous, and the valleys are narrow, the widest being not over a half mile wide.

Rock and Soil.—The greater portion of the township is underlain by limestone, thinly covered by soil on the ridges and deeply covered by sand in the valleys. The major portion of the three northern concessions is occupied by gneissic granite, with many amphibolite inclusions. Where the forest is unburned, the soil is gravelly loam covering the rock to a moderate depth, but, on the burned areas, the bare rock is largely exposed.

Forest Conditions.—Eighty-seven and one-half per cent of the township is forested. The mature forest is of the maple-beech type and it covers 35.1 per cent, while the immature poplar-birch type covers 34.9 per cent of the township. The least culled portions of the hardwood forest are in the northern and southern portions of the area lying within the watershed. The mixed forest and the coniferous forests are found in the swamps, and they comprise 3.4 per cent and 1.8 per cent of the area, respectively. Eight and one-tenth per cent of the township has been recently burned.

Peterborough County

Chandos Township

Watersheds.—Practically all of Chandos township discharges its waters into Deer river. Its water surface comprises 4,500 acres, and it is practically all contained in Loon lake.

Topography.—South of concession XIV, Chandos is a series of broad, rounded ridges and hills, having about the same elevation, 150 to 200 feet above the lakes and stream valleys. The region has the appearance of a plateau which has been dissected by the streams. North of concession XIV the elevation increases rapidly in a series of ridges to about 500 feet, above Loon lake. The northern portion of the township belongs topographically to the more rugged regions in Cardiff and Faraday, while the southern portion corresponds to the flatter regions to the southward.

Rock and Soil.—North of Loon lake the rock is about equally divided between crystalline limestone and hornblende schist and a mixture of the two intimately associated. The soil is a light sandy loam. South of Loon lake it is mostly granite and nearly related rock.

Forest Conditions.—Apparently the forests of Chandos were originally about equally divided between coniferous and hardwood lands. The former pine lands are now covered with poplar and birch, which extend over 32.1 per cent of the area. Some 18,890 acres, or 36.6 per cent of the area, now support a hardwood forest, of which all but 2,600 acres have been severely culled. The better class of hardwoods is found along the eastern margin of the township. Mixed swamps containing cedar, fir, hemlock, black spruce, black ash, elm, and maple are frequent along the slow-moving Paudash creek and Deer river. These swamps occupy 11.1 per cent of the area, and from them come most of the merchantable timber cut in the township. As a whole, 91.9 per cent of the township is forested.

Methuen Township

Watersheds.—The central and eastern portions of Methuen drain through Kasshabog lake into North river, thence by Crow river into the Trent. The waters from the northwestern portion of the township flow through Jack creek into Stony lake. The township has nearly 6,000 acres of water surface, mostly contained in Jack lake and in Kasshabog lake.

Topography.—The most conspicuous topographic feature of the township is a high ridge running in a northeast-southwest direction, and separating the Jack creek from the North river drainage. The ridge is 1,100 feet above the sea, between Jack creek and Kasshabog lake, where the ridge and its spurs are called the Blue mountains, and it rises about 300 feet above the surrounding plain. In the other portions of the township the ridges are not more than 100 feet above the streams, and, in most places, much less. The east-central portion of the township is nearly flat, and is called the Blueberry 'barrens,' an apt designation, for huckleberries are about the only things of commercial value that grow upon them. The drainage is sluggish and marshes and swales are abundant. South of this area the country is much broken by low ridges with the exception of the outcrops of sedimentary limestone near Vansickle P.O. and near Oak lake, where the topography is rolling.

Rock and Soil.—Most of the rocks are granite and hornblende schist and they are about equal in distribution. The granite lies between the schist in a band about four miles wide, extending from the southwestern corner of the township. Much of this rock is so far decayed that it can be crumbled in the hand and it gives rise to nearly pure gravel. The soil on the hornblende schist is very sandy. A small outcrop of crystalline limestone along the road in the northern portion, and the two patches of sedimentary limestone in the southern portion of the township, are the only places where a soil approaching a loam in texture can be found.

Forest Conditions.—The greater portion of Methuen was once a pinery, and 43.3 per cent of the area of the township is now a man-made barren, while 41 per cent is covered with poplar and birch arising from fires. The hardwoods occupy 12.8 per cent of the area, and they are found mostly in the northern portion, the largest patch being in the northwestern corner around Jack lake. They are all severely culled. Only 2.7 per cent of the township is under cultivation.

Burleigh Township

Watersheds.—The waters from Burleigh flow into the Trent waters by three routes: Jack creek, Eels brook into Stony lake, and Deer Bay creek into Deer bay. The latter receives the waters of a dozen lakes in the northwest quadrant of the township. The total lake surface is 3,500 acres.

Topography.—The highest points are in the north central portion of the township, where the highest ridges are about 150 feet above the general level of the low ridged plain-like surface. East of Eels brook, the plain-like character of the surface is still more apparent. The outcrops of sedimentary limestone south of the Cedar lakes are flat.

Rock and Soil.—A line drawn from the southwestern corner to the northeastern corner of the township would divide about equally the granite and crystalline limestone areas, the former being on the western side and the latter on the eastern side of the line. The crystalline limestone area contains a number of intrusions of granite which occur as low rounded ridges. The soil is absent on the higher granite ridges, a condition due to repeated fires. In fact, this is the condition on most of the granite outcrops. In local pockets and along the bases of the ridges, the soil is a light gravelly loam, and it is usually not over 8 inches deep. The soil on the crystalline limestone is of the same character, but, as a rule, it contains more sand and pebbles. On the sedi mentary limestone, the soil is a heavy loam. Near the township line, while the soil on the limestone is of good quality (silt loam and clay loam) it is too shallow for really successful agriculture on most of the farms.

Forest Conditions.—Of this township, 95 per cent is forest land, and 82 per cent of this has been burned within the past forty years. In 1911, 9.5 per cent of the area was burned ; 2 per cent ten years ago ; 70.4 per cent has been burned at various times between 20 and 40 years ago. The latter areas are covered with birch and poplar. The original forest was pine interspersed with hardwood ridges and hardwood flats around some of the lakes. The stumps show that the pine occurred in many places at the rate of 60 trees upon an acre. With the exception of a few scattered patches, 70 per cent of this area has no young white pine to take the place of that cut and burned. On 12 per cent of the area, however, there is a fair reproduction of white pine. This is most pronounced on the areas which have been burned but once. Many of the farm wood-lots on the sandy terraces of Eels brook show excellent second-growth white pine.

In the northeastern and the southwestern corners of the township, there is a culled hardwood forest, constituting 8 per cent of the total forest area. Maple and beech are the predominant remaining species, the merchantable ash, elm, and basswood having been removed. The remaining 10 per cent of the forest area consists mostly of swamps and semi-barrens.

Anstruther Township

Watersheds.—The greater portion of Anstruther is drained by headwaters of the Mississagua river, which flows into Buckhorn lake. A strip about 2½ miles wide along the whole eastern border of the township is drained by Eels brook. The township contains fourteen lakes of considerable size, the largest, Eagle lake, near the southern border, containing 1,400 acres. The whole lake surface of the township is approximately 5,000 acres.

Topography.—The highest points are a series of rounded granite hills, about 100 feet above the general level in the south central portion of the township. There are hills of about the same elevation around Eels lake in the northeastern corner of the township. The remaining portion has the usual topography of an elevated plain interspersed by ridges 25 to 50 feet above the general level.

Rock and Soil.—The township is practically all granite and rock of a similar nature, except in the valley of Eels brook, where hornblende schist and crystalline limestone occur. In the four most northern concessions across the township, the granite is covered by a loam to an average depth of 15 inches, well sprinkled with boulders and pebbles. There is a similar soil west of Eagle lake, Deer lake and Cranberry lake, and scattered patches in the eastern part along Eels brook. The rest of the soil throughout the township is mostly shallow gravel and sand. The granite hills in the interior are largely devoid of soil of any kind, a condition brought about by repeated fires.

Forest Conditions.—The forests of the township have been thoroughly culled, with the exception of some 5,000 acres in the neighborhood of Eagle lake, where the commercial timber is chiefly hemlock. There were about 1000 acres of pine and hemlock in concessions XIII and XIV along Stony creek, but one more season's cut will finish that. These two groups, with some other areas of a similar nature, make 15.5 per cent of the forest now standing, as coniferous. Approximately 7 per cent of the forest is of the mixed type—maple, beech, pine, and hemlock—and 20 per cent is pure hardwoods. Last year 1.5 per cent was burned. The remaining 56 per cent is second growth, of which 51 per cent is the poplar-birch type, the result of fire.

Cavendish Township

Watersheds.—About three-fourths of the area of Cavendish drains into the Mississagua river ; most of the remaining portion is drained into Squaw river and thence into Pigeon lake. A few square miles in the extreme northwestern corner are drained into the Irondale river and thence by Burnt river into Cameron lake. The water surface of the township is 7,600 acres, or 14 per cent of the total area. The largest lakes are Catchacoma and Mississagua.

Topography.—There is very little diversity of topography in the township, it being a succession of low ridges of similar elevation and depressions, and the highest points are in the northwestern corner of the township, where they are about 100 feet above the general level.

Rock and Soil.—The rock is, for the most part, crystalline limestone, with frequent intrusions of granite and hornblende schist. The soil is shallow, sandy, filled with pebbles and stones, and only in a few places approaches a loam below the first two or three inches.

Forest Conditions.—A little more than one-half of the forest area is, or was, controlled by the hardwoods. On the flats and gentle slopes, maple is the principal species, often composing three-fourths of the stand. On the ridges and other situations where the soil is shallow, the beech replaces the maple. The minor species are elm, basswood, hemlock, yellow birch, black cherry, and hornbeam. Thirty-six per cent of the hardwood forest is moderately culled, *i.e.* the merchantable elm, basswood, and hemlock have been cut ; 17 per cent has been severely culled. Much of this has been burned in patches. Around the upper end of Catchacoma lake there is a good forest in which hemlock is the prevailing species. This joins to the eastward with the block of hemlock in Anstruther. This, with patches of coniferous forest in other places, makes 7 per cent of the forest area belonging to the coniferous type. Of the area 2 per cent is composed of mixed forest. This has been severely culled. The remaining 38 per cent of the forest area has been burned at various times and is now chiefly covered with birch and poplar.

Galway Township

Watersheds.—The southern and western portions of the township drain southerly by Squaw river and Harvey brook into Pigeon lake, while the central western and northwestern portions drain southerly and westerly by Union creek into Four-mile lake in Somerville township and thence into Balsam lake. The largest body of water, Swamp lake, contains 1,000 acres. Lakes are not so frequent as in other townships, since only 3.5 per cent of the township is water.

Topography.—The topography, especially that of the eastern portion is similar to that already described for Cavendish. There is less relief and the ridges are broader and flatter in the western portion of the township. A high point, about a mile east of Bass lake, commands a view of the southern half of the township.

Rock and Soil.—Crystalline limestone covers the greater portion of the township. The sharper ridges are composed of hornblende schist. There are outcrops of granite and related rock in the north-eastern portion. The soil on the top of the ridges is not more than 8 inches deep ; on the slopes it is deeper but sandy, while, at the base of the more gentle slopes, good loam occurs. It is, however, patchy and restricted in distribution. In common with the whole region, swamps occupy the depressions between the ridges.

Forest Conditions.—The township is forested to the extent of 87.6 per cent of its area, a little more than one-half of which, 53.2 per cent is the old burn type. The hardwoods occupy 17.3 per cent of the area, and they are found in best development in the central portion of the township. They have been for the most part severely culled, only 900 acres being classed as virgin and semi-virgin. The mixed type as usual is found on the low lying land, and as usual makes up a small percentage of the area (4.4 per cent). The area of the coniferous type (12.2 per cent) is relatively large. This is due to a block of pine in the western portion of concessions V, VI, VII, and VIII. Four-tenths per cent of the township has been recently burned.

Harvey Township

Watersheds.—The principal stream in the township of Harvey is the Mississagua river, which drains Mississagua, Catchacoma, Gold, Eagle, and other lakes of this series in the townships of Cavendish and Anstruther. The most northern headwaters of the stream are found in Glamorgan township not far from the village of Gooderham. The river meets the canal waters in Buckhorn lake about a mile east of Hall Bridge. This stream and its tributaries drain the eastern portion of the township. The central and northwestern portion of the township is drained into Pigeon lake by Squaw river and Harvey brook, while the southeastern portion is drained by Deer Bay creek, which has its origin in the lakes of Burleigh. Buckhorn lake and its water-connections with Stony lake form the southern boundary of the township, while the southwestern boundary is formed by Pigeon lake. Compared with the townships to the eastward, Harvey contains few lakes in the interior.

Topography.—The higher and rougher portions are in the granite areas in the eastern portion of the township. This is due to elevation, as well as to the presence of numerous ridges and knolls of glacial drift. The western half of the township is quite flat, except where the streams have worn through, or where granite out-crops through the prevailing sedimentary limestone.

Rock and Soil.—As indicated above, the rock is mostly granite and sedimentary limestone. The eastern and northern portions of the township are mostly granite, with outlying patches of sedimentary limestone. West of Harvey brook and in the area lying between Buckhorn lake and Pigeon lake sedimentary limestone with local patches of granite is found. The soil on the granite areas is very thin and, in many places, entirely absent, while that of the limestone areas is, for the most part, of agricultural quality, being silt loam and clay.

Forest Conditions.—A little over one-half (50.8 per cent) of the township has been thoroughly culled and burned, and is now occupied by the poplar-birch type of forest.* It is apparent that the granite areas were originally occupied by pine, hemlock and spruce, and the limestone areas by hardwoods. The coniferous forests at the present time cover only 1.4 per cent of the area, and the largest block may be found in the northeastern corner of the township. The hardwoods are mostly maple, beech and basswood, and they occupy 22 per cent of the area.† The mixed coniferous-hardwood type is poorly developed, comprising only 1.7 per cent of the area. The granite areas, with the soil mostly absent, are barrens. These are found in the southeastern corner of the township and near the mouth of the Mississagua river, and they cover 8.6 per cent of the area. A little over 1 per cent of the township has been recently burned.

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*For a description of the composition of this type see page 58.

†See pages 46 and 47.

Victoria County

Somerville Township

Watersheds.—The township is drained almost entirely into Balsam lake by three streams. Burnt river flows diagonally from the northeastern to the southwestern corner of the township, Gull river forms the western boundary of the township. Midway between these streams, near the central portion of the township, is Four-Mile lake, which, with its receiving and discharging streams, makes another valley parallel to those of the first mentioned rivers. The drainage of the extreme southeastern corner of the township flows into Sturgeon lake after passing through the northern half of Verulam.

Topography.—The topography of the township is determined by the three streams mentioned above, since they have worn rather wide valleys into a plateau. The ridges are low, often with flat divides between the streams.

Rock and Soil.—If an irregular wavy line be drawn from the southeastern corner of the township to the central point of its northern boundary, it would separate in general the granitic rocks on the east and north from the sedimentary limestone on the west and south. The extreme northwestern portion of the township, however, is granitic. The transition from the granite to the limestone is in many places marked by an abrupt escarpment, as may be seen along the road on the 13th concession line. The soils both on the limestone and on the granite in the northern portion of the township are thin and sterile. Those on the limestone in the southern half of the township are deeper, but even there the best farms are in the wide valleys of the Burnt and Gull rivers.

Forest Conditions.—Somerville has practically no forest containing saw-logs, outside of a few swamps and farm wood-lots. Sixty-one and seven-tenths per cent of the area is occupied by the old burn type. The mixed forest comprises 5.1 per cent, the hardwoods 4.4 per cent, and the conifers 1.3 per cent of the area ; and all three of these types have been severely culled.

Haliburton County

Cardiff Township

Watersheds.—About 12 square miles in the northeastern corner of Cardiff township drain eastward into the York river waters ; the drainage of the remainder of the township goes into the Trent waters.

The waters from a little more than one-half of the area drain into Paudash lake in the east-centre of the township. From this, they flow by Paudash creek and Deer river into Crow river and thence into the Trent canal. The waters of the southwestern quadrant of the township collect in Eels lake and are carried by Eels brook into Stony lake. A portion of the northwestern quadrant of the township is drained southwesterly into Irondale river and thence by Burnt river into the canal, at Cameron lake. The township contains 5,330 acres of water surface. The largest lake is the Paudash group which contains about 1,400 acres.

Topography.—The eastern half of the township is a high plateau which has been dissected into broad rounded ridges. The plateau ascends in going northward, and in the northern portion of the township is 50 to 100 feet higher than in the southern. The most pronounced ridges in this area lie west of Paudash lake and on the divide between the York and Trent waters. The ridges in the northwestern part of the township are nearer together and sharper in outline. The highest points in Cardiff are in the granitic outcrop in the southwest quadrant of the township. Swamps are frequent; the largest, containing some 2,500 acres, is found in the southeastern corner of the township.

Rock and Soil.—The rocks of the township are about equally divided between granite, hornblende schist, crystalline limestone and gneiss. The granite lies in the northeastern and the southwestern corners of the township, and the two outcrops are connected by a narrow band west of the north arm of Paudash lake. A large area of hornblende schist lies between these two granite masses. Most of the limestone is in the southeastern corner of the township. The gneiss lies for the most part around the borders of the granite. From Cheddar post-office eastward and northeastward nearly to the township line there is a belt of fairly deep glacial drift soil, on which the good upland farms of the township are located. In the rest of the township the soils are thin or sandy.

Forest Conditions.—The township is covered with forests to the extent of 93 per cent of its area. Somewhat more than half (56.6 per cent) of the area was originally covered mostly with pine, but it has been replaced by the old-burn poplar-birch type. The coniferous forest is now confined to the swamps ; it occupies 7.7 per cent of the area, and has been thoroughly culled of its commercial timber. The hardwoods cover 13,000 acres, one-quarter of the township, and only 200 acres of these were classified as virgin and semi-virgin. The mixed coniferous and hardwood type occupies 4.3 per cent of the township. Only 0.1 per cent of the area has been recently burned.

Monmouth Township

Watersheds.—The waters of Monmouth are carried to the Trent canal by the way of the Irondale and Burnt rivers. A small portion, however, in the southeastern corner is drained southward by Eels brook. Otter lake is situated in the northeastern portion of the township, and contains only 600 acres. The entire water surface of the township is 2,100 acres.

Topography.—The highest points in the township are in the granite region in the southeastern corner of the township, the region west of Otter lake, and the extreme southwestern corner. These places look really mountainous when compared with the general dissected-plateau topography of the rest of the township.

Rock and Soil.—The geological structure of the township is much diversified, since it contains representatives of nearly all the different kinds of rocks found in the Trent watershed. The greater portion of the rock, however, is crystalline limestone with its various impurities. The deepest and finest textured soil is found in the south central portion of the township, it being an extension of the drift soil, covering northern Anstruther. The upland soils in the other portions of the township are usually thin or, if deep, very stony. Bare ridges and ledges, are frequently exposed.

Forest Conditions.—The southern portion of the township, with the exception of the southeastern corner, was originally a pinery, while the northern half was, and still is, of the hardwood type, with former pineries on the stream terraces. The old pinery is now occupied by poplar and birch, a type that covers 38.4 per cent of the township. At present only 1.1 per cent of the township is coniferous. The hardwoods, as a rule, contain little saw-log material. They cover 47.7 per cent of the area. The mixed type covers 1.9 per cent, and recent burns 2 per cent of the township.

Glamorgan Township

Watersheds.—The township of Glamorgan drains into the Trent canal by the way of the Burnt and Irondale rivers, the latter taking most of the drainage. It contains eight rather small lakes, the largest being Koshlong, in the north-central portion of the township, with an area of 770 acres. The water surface of the township is 3,900 acres.

Topography.—The roughest and the highest portion of the township may be found in the diorite in the southeastern corner. Greens mountain at the western edge of the outcrop has an altitude of 1,466 feet above sea level, and it stands about 250 feet above the general level of the plateau. The rest of the township has the characteristic topography of low, broad, major ridges and lower, sharper-crested minor ridges.

Rock and Soil.—The eastern portion of the township south of Mink lake and in the valley of the Irondale river on the south, is underlain by crystalline limestone. Most of the remaining portion, except for the diorite area in the southeastern corner is granite. The upland soils throughout the township are, almost without exception, absolute forest soils, being too thin, too sandy, or too stony for successful farming.

Forest Conditions.—Of the area of the township, 68.5 per cent is of old-burn type, mostly the result of an extensive fire about 30 years ago. This was once a pinery. At present only 0.5 per cent of the area is covered with a coniferous forest. The hardwood type occupies 20.7 per cent of the township, most of it being in the southeastern corner. This is composed of farm wood-lots, and it has been severely culled of its saw-logs. The mixed coniferous-hardwood type has an extent of 1.1 per cent, and the recent burns cover 1.3 per cent of the township.

Lutterworth Township

Watersheds.—The drainage of the major portion of Lutterworth is into Gull river. The southeastern corner of the township, however, is drained by tributaries of Burnt river. Seven per cent of the township is covered by water.

Topography.—The portion of Lutterworth north and west of Gull lake is very rough, a maze of ridges and monadnock hills, but, as one goes southward, the altitude decreases, the ridges are lower, broader and farther apart, until, at the southern border, the region has the appearance of a plain into which the streams have worn narrow valleys.

Rock and Soil.—The rock of the township is about equally divided between granite and crystalline limestone with frequent intrusions of granitic and hornblende rock. The latter lies in a strip about five miles wide, passing diagonally through the township on the southern and eastern side of Gull river. In the south central portion of the township there are outcrops of sedimentary limestone. Except in the immediate stream valleys, the soil throughout the township is either thin and sandy, or deep and stony. Obviously, nature never intended it for a farming township.

Forest Conditions.—The greater portion of the township was evidently once an immense pinery, but now only 0.1 per cent of its area is covered by a coniferous forest. The former pinery, 78 per cent of the area, is now covered with poplar, most of which is the result of fire in the early 'eighties.' The mature forest is now represented by maple-beech wood-lots from which most of the merchantable saw-logs have been removed. These comprise 9.9 per cent of the area. One and five-tenths per cent of the township supports a mixed coniferous-hardwood forest, also severely culled.

Snowdon Township

Watersheds.—The township of Snowdon is drained by Burnt river and its tributaries. The largest of these, the Irondale (in reality the main stream, but not so named), after collecting the waters of the southeastern third of the township, meets the Burnt river at Kinmount Junction. Near the same point another stream enters from the north, flowing just back of the Bobcaygeon lots nearly across the township. Near the centre of Snowdon, Burnt river receives another branch flowing from the Canning-Kashagawigamog lake series in Minden and Dysart.

Topography.—The eastern portion of Snowdon is the more diversified, having numerous rather sharp crested ridges. The western half of the township is a broad plateau, not dissected to the usual extent.

Rock and Soil.—The township is composed chiefly of granitic rock. A narrow strip along the northern boundary and the northwestern corner, as well as the southeastern corner, are occupied by outcrops of crystalline limestone. The northern third of the township is fairly well covered with glacial drift, with loamy but rather stony soils. To the southward the soils are thinner, with frequent outcrops of bare rock, especially in the areas lying between the Burnt and Irondale rivers.

Forest Conditions.—Like Lutterworth, the greater portion of Snowdon was once covered with pine, and it, too, is now practically without mature forests, since the aggregate of the scattered patches amounts to only 7 per cent of the area. Of this, 3.1 per cent is of the hardwood type, 2.3 per cent mixed, and 0.6 per cent coniferous. All of these have been severely culled of their saw-logs. The present forest is, to the extent of 81.5 per cent of the area, of the poplar-birch old-burn type.

Minden Township

Watersheds.—The waters of Minden reach the Trent canal through Burnt and Gull rivers, the former draining the northwestern half and the latter the southeastern half of the township. Minden is well supplied with lakes. Little Boshkung, Twelve-mile, Mountain and Horseshoe lakes, through which Gull river passes, total about 2,600 acres of water surface, and Soyers, Kashagawigamog, and Canning lakes, drained by a branch of Burnt river, have approximately the same area. Water forms 11.7 per cent of the total area of the township.

Topography.—The highest points and most rugged topography of the township are found in the outcrop of volcanic rock lying west of Kashagawigamog and Soyers lakes. The rest of the township has the usual dissected plateau appearance.

Rock and Soil.—The greater portion of the township is underlain by crystalline limestone, with the usual intrusions of gneissic and hornblendic rock. A large outcrop of volcanic rock appears in the central portion of the township. Its crest forms the watershed between the two principal streams and the contact between it and the limestone is marked by a pronounced escarpment, especially along the western side of the outcrop. The northwestern portion of the township, west of Mountain and Twelve-mile lake is underlain by gneissic granite. The eastern two-thirds of Minden is deeply covered with glacial drift, and the soil varies from a clay loam, through sandy loam to almost pure sand, the poorer upland soils being in the southern portion of the township. Excellent farm soils are found on the first terraces of the lakes, and on the flood plains of the streams, especially along Gull river. The soils within the granite area, except in the stream valleys, are thin and sandy.

Forest Conditions.—Minden was originally covered with hardwoods, except for the sandy terraces along the streams and lakes, which were covered with pine. This forest is now, for the most part, represented by severely culled wood-lots, which constitute 44.4 per cent of the area. About 14 per cent of the hardwood type has been only moderately culled. The largest block of this lies west of Twelve-mile lake. The mixed type occupies 4.3 per cent of the area, while only 1.6 per cent is coniferous, and this is mostly spruce-balsam swamp —not pine. Only 18.1 per cent of the township is composed of the poplar-birch type, and this probably represents the extent of the original pineries.

Dysart Township

Watersheds.—Burnt river and its tributaries carry the surface waters of Dysart into the canal. The eastern extension of the northern tributary is called the Haliburton river, while Burnt river proper drains the southern portion of the township. The largest body of water is Kashagawigamog lake, which extends into the township from Minden and Grass lake. Together they present a water surface of about 820 acres.

Topography.—The southern half of the township is of the broad plateau type, with the most dissected part in the eastern portion.

North of Kashagawigamog lake and Haliburton river the summits are from 200 to 400 feet higher than in the southern portion of the township; the valleys are deeper and the topography more rugged. The Haliburton river flows through a narrow valley about 300 feet below the general level of the plateau.

Rock and Soil.—A band of crystalline limestone about two miles wide crosses the central portion of the township in an east and west direction. On both sides of this the rock is gneissic granite, with many amphibolite inclusions. The contact of the limestone with the granite on the north is marked by the valley containing Kashagawigamog, Grass and Head lakes, and Haliburton river. The soils on the granite throughout are thin and stony, and are of little agricultural value. Some good upland farm soils occur on the limestone south and southwest of Haliburton village.

Forest Conditions.—The forests of the township are prevailingly of the hardwood type (57.1 per cent) of the area. They have been depleted of their timber trees and, in some places, have been very severely culled. The poplar type occupies the next largest area (24.6 per cent); 3.4 per cent of the area is mixed conifer and hardwood and 1.8 per cent pure conifer. The latter is mostly balsam-spruce swamp. Recent fires cover only 1.7 per cent of the township.

Dudley Township

Dudley was not visited by the writer. It is drained by Burnt river and the Haliburton and Irondale branches. Drag lake in the central western border of the township is the largest body of water, and covers about 1,700 acres. Two other lakes of considerable size, Lake Miskwabi and Lake Kennibik, are found in the south central portion of the township. The total water surface of the township is 4,800 acres. Except for the region about the two last-mentioned lakes, where the rock is crystalline limestone, the prevailing rock of the township is gneissic granite. The township is characterized by a hardwood forest which occupies 89.7 per cent of the area, and, as a whole, it has not been severely culled. Four and four-tenths per cent is of the mixed and 4.9 per cent of the poplar type. Farms occupy only 1 per cent of the area.

Guilford Township

Watersheds.—The township of Guilford belongs to the Gull River drainage system. The streams are mostly only short connecting links between the numerous lakes. The township has the largest water surface of any of those considered in this report, nearly 6,000 acres in all, or 13 per cent of its area. Redstone, situated in the northeastern portion of the township, is the largest lake, having a surface of 2,500 acres.

Topography.—The topography of the township increases in diversity, and the ridges become higher towards the north, where they stand about 300 feet above the water courses.

Rock and Soil.—The valley containing Eagle, Cranberry, Grass and Pine lakes is crystalline limestone. The rest of the township is gneissic granite. The whole township is well covered with glacial drift soil, which is, for the most part, a stony sandy loam, and is thinly distributed on the higher slopes.

Forest Conditions.—Apparently there was considerable pine scattered through the original forest, but this has now been removed, except for a patch of some 3,000 acres in the northwestern corner of the township. Along the streams and around the margins of the lakes, hemlock is abundant, especially around the chain of lakes lying westward of Redstone lake. As a whole, the proportion of conifers is greater in the northern portion of the township. The forest is, however, prevailingly of the hardwood type, which comprises 62 per cent of the area.* The coniferous type is next in abundance, covering 23.1 per cent of the area. Four and six-tenths per cent of the township is covered by the old-burn type and 3.8 per cent by the mixed mature forest.

Stanhope Township

Watersheds.—Stanhope has the most picturesquely situated lakes within the area of this report, being for the most part surrounded by mature forests. The three largest, all about the same size, are Boshkung, Kashagawi, extending clear across the western border of the township, and Pipikwabi. Each of these has a surface of about 1,600 acres. The total water surface of the township is 4,500 acres, or 12 per cent of its area. This township drains into Gull river.

Topography.—The southern half of the township has the typical plateau topography, with frequent sharp peaks and knolls standing a hundred feet or so above the general level. The ridges are more frequent, and the valleys deeper, in the northern half of the township.

Rock and Soil. — The southeastern portion of the township is underlain by crystalline limestone. The remaining portion of it is gneissic granite. The southern third of the township is deeply covered with drift soil, frequently of sufficient fineness to make good agricultural soils. The soils in the northern portion are thin and stony.

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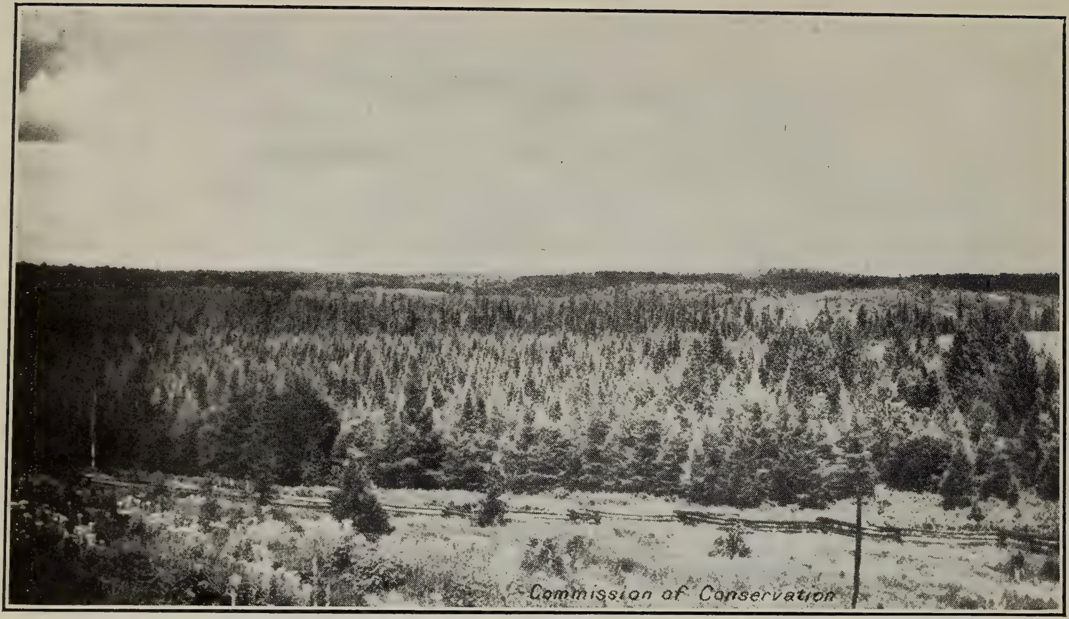
* For the composition of this type see pages 45, 46.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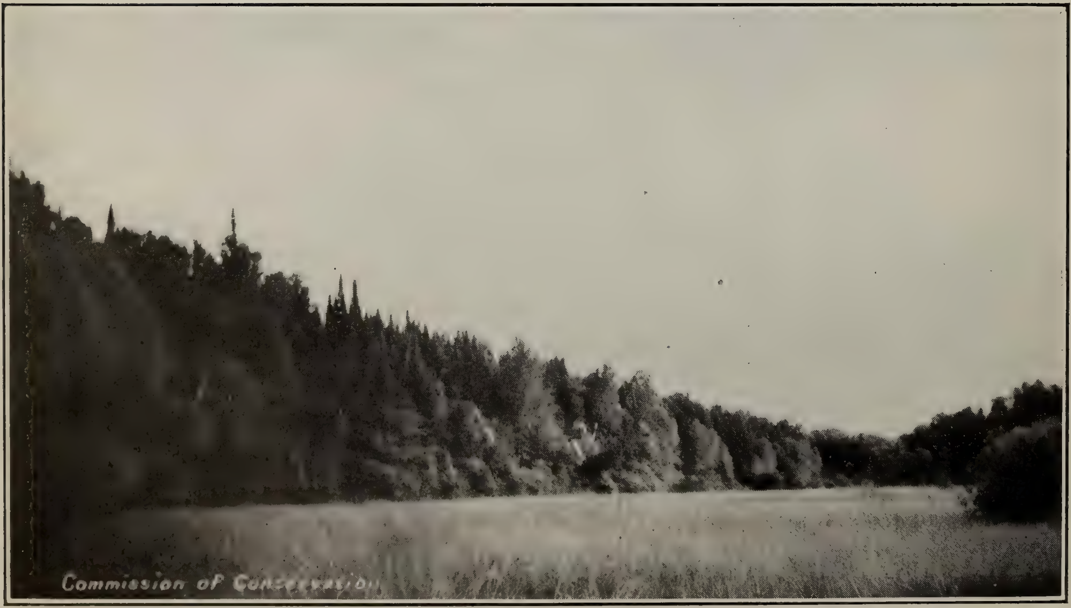
BALSAM-CEDAR SWAMP: A VERY COMMON TYPE ESPECIALLY IN THE NORTHERN TIER OF TOWNSHIPS


Commission of Conservation

NATURAL MEADOWS AND SWALES ARE FREQUENT BETWEEN THE GRANITE RIDGES

Forest conditions.—The southern portion of the township was originally covered with hardwoods, now represented by farm wood-lots. In the northern portion conifers were, and still are, more abundant. The areas occupied by various types are as follows : hardwoods 29.8 per cent ; poplar-birch 26.9 per cent ; mixed 17.3 per cent ; conifers 10.7 per cent ; recent burns 3.2 per cent.

Anson and Hindon Townships

Some 15,700 acres along the eastern side of Anson lie within the Trent watershed. Most of this area (62.8 per cent) was once covered with pine, but is now occupied by the usual poplar-birch type which follows burning. The hardwoods cover 22.9 per cent of the area and have been severely culled. The mixed coniferous-hardwood type occupies only 1.5 per cent of the area. Twelve and six-tenths per cent of the township within the drainage basin is cleared land.

Only 5,000 acres of Hindon are contained within the Trent watershed. Of these, 3,200 acres—or 62.5 per cent—are now controlled by the poplar-birch type. Severely culled hardwoods cover 1,680 acres, or 32.4 per cent of the area. The remaining portion, 266 acres (5.1 per cent) is farm land.

Harburn Township

The township of Harburn was not visited by the writer, so he is unable to describe it from a topographic standpoint. The lakes of the township form the easternmost headwaters of the Gull River system. Haliburton lake is the largest body of water and it covers some 2,400 acres. With the exception of the southwestern corner, which is underlain by crystalline limestone, the rocks are gneissic granite. As swamps are more numerous than in the other northern townships of the Trent watershed, spruce, balsam, and cedar are more abundant. With regard to the proportion of the area occupied, the forests were classified as follows : hardwoods 58.1 per cent ; conifers 28.4 per cent ; mixed type 12 per cent ; poplar type 0.5 per cent. Only 1 per cent of the township is cleared for farming purposes.

Sherborne, Havelock and Eyre Townships

Portions of Sherborne, Havelock, and Eyre belong to the Gull River drainage system. Their topography and geology are similar to those already described for northern Stanhope and Guilford. The prevailing type in Sherborne is the mixed coniferous-hardwood forest, which occupies 72.5 per cent of the area within the watershed and four-fifths of this, some 8,000 acres, is virgin or semi-virgin. The old burns occupy about one-quarter of the area. Havelock has a prevailing coniferous forest of spruce, hemlock, balsam and pine, covering 28,000 acres within the watershed, and it is all virgin and semi-virgin. The forests of Eyre are also coniferous ; the western half of the drainage basin containing spruce, balsam, and pine ; the eastern half spruce, balsam, hemlock and scrubby hardwoods. These cover some 25,000 acres and they have been only slightly culled.

III

Economic and Industrial Conditions

Farming Conditions

It is evident from the geological origin and nature of the soil of the region under discussion * that it is, for the most part, unsuited to agricultural pursuits ; yet the bulk of the population is engaged in farming. In general, the soil is shallow sand or gravel of glacial origin, only in limited areas of sufficient depth to permit the growth of crops. It follows that the farming settlements are found mostly in segregated blocks wherever the latter condition obtains. For the same reason, the area under cultivation on each farm is very small. Neglecting the three or four best agricultural townships, the land which is being actually tilled does not average more than 15 to 20 acres per hundred acres cleared or farmed. Under certain conditions of soil and market, and with intensive farming, this would suffice for a good living, but not under the present conditions prevailing in the Trent watershed. This low figure of actually tilled land is in itself indicative of the non-agricultural nature of the region.

This is further brought out in the following table, which gives the percentage of land cleared for farming purposes in each of the townships investigated.

Anstruther	3.5	Limerick	12.1
Burleigh	4.7	Lutterworth	10.4
Cardiff	7.0	Marmora	26.2
Cashel	6.6	Methuen	2.7
Cavendish	1.4	Minden	31.5
Chandos	18.2	Monmouth	8.9
Dysart	11.4	Snowdon	12.4
Faraday	12.5	Somerville	27.3
Galway	12.4	Stanhope	12.1
Glamorgan	7.9	Tudor	12.3
Harvey	14.0	Wollaston	16.1
Lake	2.0		

These percentages include the land under tillage and pasturage, the latter usually in a worn-out condition or even grown up with brush. Needless to say, not all the clearings were mapped ; their patchy nature, in many cases, led to their being overlooked, and, in other cases, this would have made an exact estimate of the total clearings on a farm too costly in time, especially since this information was only secondary to the forest investigation. The above figures, as a rule, are higher than those given in the returns of township assessors, because the latter generally reduce the area of fields by allowance for rock exposures, stone piles, swamp, thickets, etc.

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* See pages 37, 38 ; 68-89 for a brief description of the geology of the region by townships ; and 108-113.

The average per cent of cleared land for the 1,171,614 acres investigated was 11.4.* The township of Minden leads in the percentage of land devoted to farm purposes, with Somerville, Marmora, Chandos and Wollaston next in order. Neglecting these five, which for special reasons will always remain farming townships, and those where too small a portion lies within the watershed for arriving at a fair proportion (Anson, Herschel, Hindon, Ridout), we find that the typical condition in the forest townships is 8 per cent of cleared land. The assessors' figures would give a smaller percentage, and figures of land really adapted to farming, still less.

Details of Farm Distribution

A brief description by townships will serve to present the typical state of affairs in attempting to farm soils which are much better adapted to forest use.

1. *Hastings county*—Referring to the Forest Distribution map accompanying this report and beginning in the east, the Hastings road, with the townships of Lake and Wollaston on the west and Tudor and Limerick on the east,—an early colonization road—presents to-day a picture of more abandoned farms than occupied ones. Lake township is almost without settlement. Cashel contains one small settlement in the south-west. Tudor and Limerick, though thinly settled, contain but little agricultural soil. Wollaston, with the exception of the Ridge settlement, is farming a ridge of sand. The western portion of Faraday, embraced within this watershed, possesses considerable settlement, despite the unsuitable character of the soil. This is largely owing to accessibility to railway transportation in three directions—Bancroft, Deer Lake and Coehill. Much of this township is patented under the Mining Act.

2. *Peterborough county*—The Wollaston sand ridge extending west through Chandos furnishes that township its best farming area ; the farms in southern Chandos are rough and stony. Methuen, with one road running down the eastern portion, has a few farms in the north, one settler at Sandy Lake near the centre, and two small settlements (Oak Lake and Vansickle) in the south-east, on limestone areas ; the remainder of this barren township is totally uninhabited. The remaining townships of Burleigh, Harvey, Galway, Cavendish and Anstruther form a block provided with three roads, the Burleigh, Buckhorn and Bobcaygeon, running northerly. Farming in Burleigh

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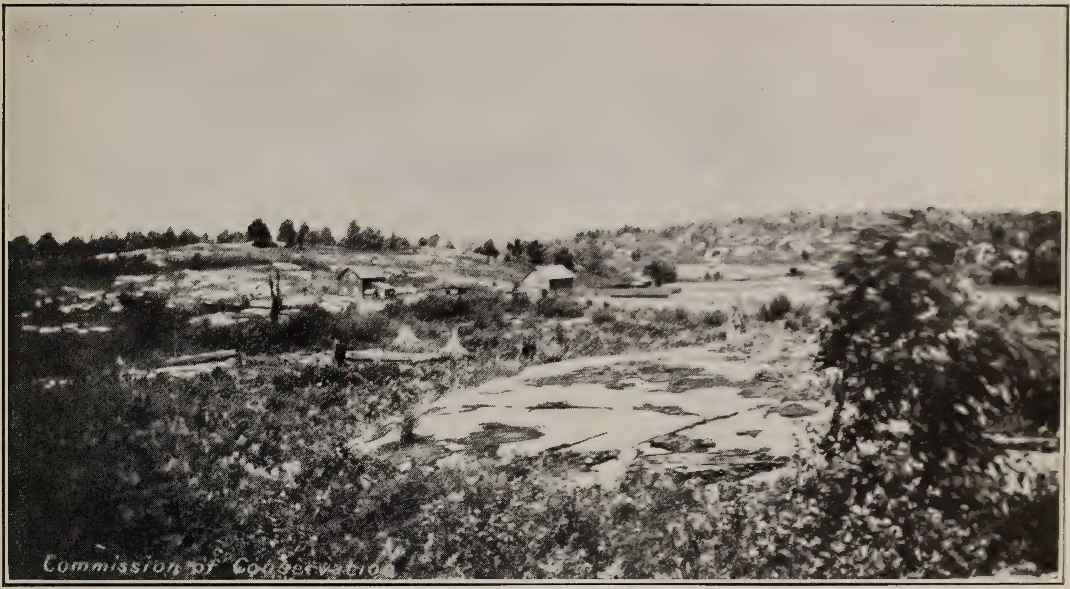
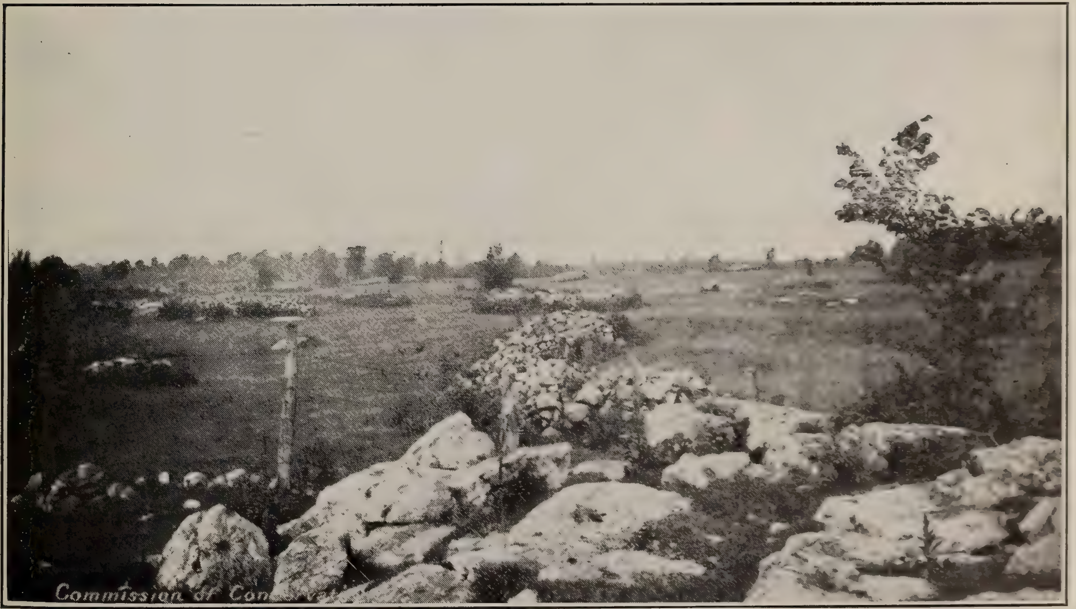
*This calculation omits the practically unsettled townships of Bruton, Dudley, Eyre, Guilford (in part), Harburn, Harcourt and Havelock, to the extent of 173,932 acres. The inclusion of these would bring the percentage still lower.


Commission of Conservation

TILLABLE SOIL ON UPLAND GRANITE AREAS IS CONFINED TO SMALL PATCHES BETWEEN THE RIDGES


Commission of Conservat

FARM ON A GLACIAL MORAINE. NOTE THE STONE PILES

township is confined to a straggling settlement along the Burleigh road, the very narrow former bed of Eels brook being utilized for the purpose, and another, westward, towards Burleigh Falls. Summer visitors to Mt. Julian, Burleigh Falls, and Buckhorn are familiar with the poor character of the soil in those vicinities; the whole of Burleigh township is also as little adapted to farming operations. Burleigh road continues up the east side of Anstruther with a thin sprinkling of farms from Apsley to Clanricarde, and this, together with the Hadlington community, is the extent of settlement in this township. Ten deserted farms were counted within that compass. To the west of Anstruther lies the township of Cavendish with the Buckhorn road up the centre and a cross road to Mt. Irwin ; about a dozen families live within the township. The portion of Harvey east of the Buckhorn road is unsettled, the land being similar to that of Burleigh township. The relatively high percentage of cleared land in Harvey given on page 91 is due to the inclusion of south Harvey and the part adjacent to the Bobcaygeon road—a limestone area on which fine farms are found. In Galway, outside of the Mt. Irwin and Bobcaygeon Road settlements, there are few farms to be seen. Somerville, with 27 per cent of the land cleared, though much of it is unsuited for farming, was included in this report merely to round out the watershed.

3. *Haliburton county*—In Lutterworth the farms are confined to the Bobcaygeon road and the region south-west from Minden, many of them abandoned. Proceeding easterly through the other townships the settlement is largely related to the railways. Snowdon, with 22 abandoned farms, has its farming industry centred mostly about Gelert. Glamorgan's farming is mostly confined to the vicinity of the railway ; 17 abandoned farms out of a total of 143 attest their owners' opinions as to the suitability of the soil for this purpose. In Monmouth, the farms occur scattered through the country tributary to the railway, the main settlements being Hotspur, Tory Hill, Essonville and Wilberforce. In Cardiff the farms occur in small remote settlements, principally in the northern half. The township has some 18 abandoned farms ; 9 of them almost in succession are to be seen on the road running along the south side of Paudash lake. Minden is an old farming township, one of the best. Stanhope has settlements scattered through the south half. The remaining northern townships are privately owned and practically unsettled with the exception of central Dysart.

Farming Methods

This sparse and checker-board-like distribution of the farming settlements in a territory which has been open for settlement for over forty years is indicative of the difficulty of finding soil to till. The striking number of abandoned farms occurring in every township tells its own story. Neglecting the townships of Wollaston, Chandos, Somerville and western Harvey, the three southerly tiers of townships in the region concerned contain, as a whole, few agricultural areas beyond mere gardens, such areas not totaling even 10 per cent of the land area. They constitute a territory whose obvious use is for forest growth.

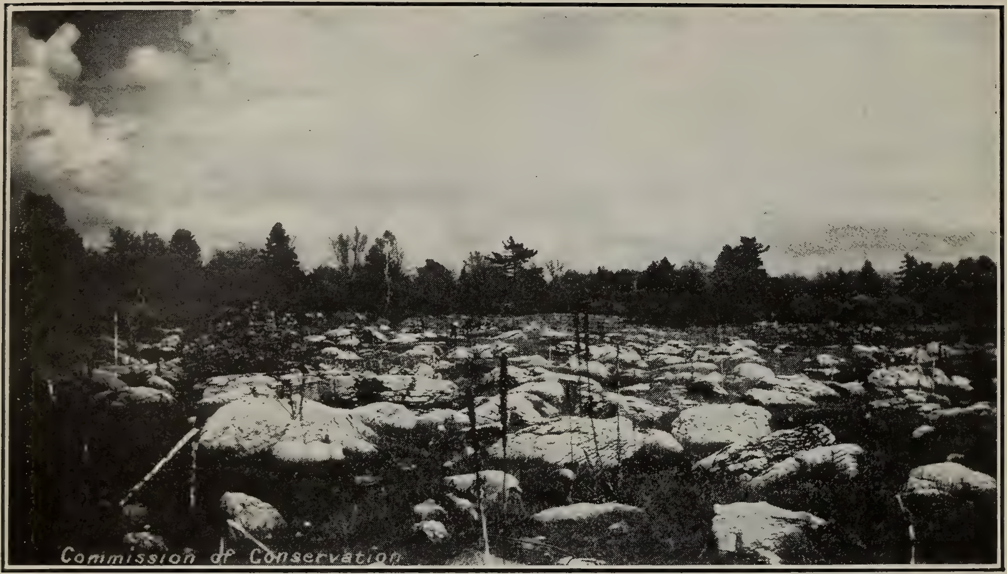
The farming practice is along lines especially called forth by the natural conditions already described. Generally speaking, the only crops are hay and oats, but it is a struggle for each settler to grow even enough of these for his own use. The shallow soil requires frequent rains as an absolute necessity for the vegetation, so that two weeks of hot dry weather means poor crops, as was evidenced in many districts during the past season.

However, with an abundance of rough grazing land, the main interest centres in dairying. Scattered throughout the whole region, especially the eastern portion, in each settlement is to be found a farmers' co-operative cheese factory, and one is impressed with the extent to which each settler is dependent on his cows. In the western portion and especially along the Irondale, Bancroft and Ottawa railway, the dairy industry takes more usually the form of cream shipments to centres of consumption farther south, or to local creameries. Worthy of note among these latter is the creamery at Kinmount, which manufactures some 30,000 pounds of butter annually. But, as a general rule, the cattle are not high grade and the returns are not very satisfactory. The average gross returns are about $20 to $30 per cow for the season, or about $5 per cow per month. In addition, as the number of cattle a settler can winter is controlled by the crops he can raise in the summer, the size of each individual operation is limited. The dearth of hay land is partially met by the natural meadows and marshes which are eagerly sought out.

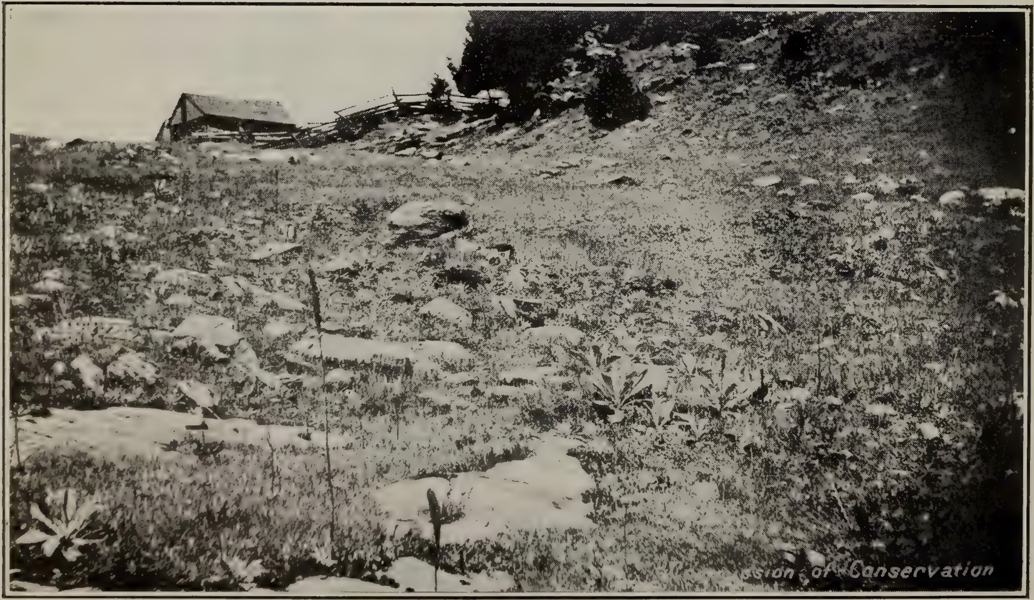
There is no doubt that there is room for improvement in the farming methods followed, especially as regards rotation of crops, soil manuring and improvement of stock. Relatively little sheep raising is done, and fruit growing is not attempted at all. The formation of co-operative breeding associations and farmers' institutes, together with the circulation of farm journals, would help the general status of the agricultural industry. But the fact remains that the soil is only here and there suited to that use.

Abandoned Farms

With conditions so unfavourable to agricultural activities the returns suffice for a bare living, which must usually be supplemented from some other source. Many, after years of struggle, have given up


Commission of Conservation

FIELD STREWN WITH LIMESTONE BOULDERS: GOOD PASTURAGE, HOWEVER, BETWEEN THE BOULDERS


ssion of Conservation

POOR PASTURAGE: MAXIMUM DEPTH OF SOIL LESS THAN TWELVE INCHES the fruitless attempt, and to-day the whole region with which this report deals is dotted with abandoned farms.* During the survey it was made the practice to ascertain why the former owner had left, though a glance at the fields was generally sufficient. There was always the same explanation — inability to make a living. Time and again, following a spur road, it would be found ending in a remote pocket of soil, which had once been ferreted out as good farm land, but which had, after all, been finally abandoned. Along the earlier colonization highways one finds long stretches unsettled to-day and with no signs of any former occupation beyond the mute testimony of neat piles of stones or occasional ornamental or fruit trees. There is not a single township but has its quota of such examples as indicated on the map. Often, these abandoned farms are among the best in the settlement, but their owners could not continue getting a mere subsistence despite their best efforts. Instances were met where the owner had simply left his farm, often with buildings above the average, unable to find a purchaser.

The following statistics of population, taken from the Dominion Census returns, indicate the extent of decline during the last decade.

	Population	
Township :	Census 1901	Census 1911
Anstruther	542	290
Burleigh	145	352
Cardiff	698	518
Cashel	200	176
Chandos	806	753
Dudley	80	30
Dysart	643	475
Faraday	1339	752
Galway	698	338
Glamorgan	527	482
Guilford	263	262
Harburn	78	56
Harvey	1199	1027
Lake and Marmora	1931	1762
Limerick	597	448
Lutterworth	464	411
Methuen	247	107
Minden	1170	984
Monmouth	629	699
Snowdon	856	760
Somerville	2105	1870
Stanhope	500	489
Tudor	632	643
Wollaston	834	911
Total	17,183	14,595

From these figures it is seen that there has been a decline of 15.2 per cent. How much of this is due to the same causes as are accountable for the rural decline throughout Ontario generally cannot be known, but it can be surmised from the fact that the average decline of Ontario is only 4.2 per cent. As is to be expected, it is usually the more progressive settlers and the young people who have fewer ties who are not content to stay.

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* The term "abandoned" is here applied to a farm which from the appearance of the buildings, etc., it is evident to the passer-by has been deserted by the original owner ; the land, however, is generally in use by a neighbour.

In daily talks with settlers throughout the investigation there was general agreement that, in their own language, "this country was never meant to be farmed" and that " they would get out if they could." They were anxious to know the possibilities in Northern Ontario and the western prairies, and envied the immigrant farmer with his fertile soil.

It may be here explicitly stated that the settlers throughout are an energetic, hard-working, resourceful people ; but they face an impossible proposition. They are, to a large extent, emigrants from the more southerly townships attracted years ago by free land. In addition, work in the lumber woods was plentiful and a livelihood was assured. A study of the conditions of occupancy shows that some 75 per cent of the lots were patented when the patentee had the right to the timber without pine reservation. It cannot be doubted that much of the land was patented for the timber it carried, and not on account of its agricultural suitability. But, with the gradual disappearance of lumbering activities the settler was finally forced to make a living by farming. This largely explains the present conditions.

The yearly sale by the county treasurer of lands for taxes unpaid for three years is the closing scene in this struggle to wrest a living from non-agricultural soil. Incidentally, these sales reveal the low cash value placed upon these farms by their owners.

The following figures are compiled from the official lists for 1912 :

I. Peterborough County :

Township	Number of Farms Advertised for Sale	Aggregate Acreage	Aggregate Taxes for 3 Years
Methuen	6	1,000	$ 69.28
Burleigh	6	639	110.57
Chandos	6	592	81.26
Galway	9	900	59.69
Cavendish	4	400	44.99
Harvey	4	430	53.03
	35	3,961	$418.82

II. Hastings County :

Township			
Lake	35	4,517	$ 289.55
Faraday	4	532	54.00
Limerick	17	965	131.78
Tudor	27	2,325	239.30
Wollaston	23	1,140	297.75
	106	9,479	$1,012.38

Commission of Conservation

TYPICAL UPLAND FARM AND FARM BUILDINGS

Commission of Conservation

A BETTER TYPE OF FARMING COUNTRY. GULL RIVER VALLEY NEAR MINDEN

III. Haliburton County (1911 List) :

Township			
Cardiff	7	700	$ 222.89
Dudley	1	100	25.36
Dysart	1	64	33.61
Glamorgan	6	552	210.62
Guilford	2	162	20·42
Harburn	3	200	69.97
Lutterworth	7	332	176.89
Minden	5	434	273.74
Monmouth	13	1,318	409.15
Snowdon	8	783	304.44
	53	4,645	$1,747.09

A total of 194 farms comprising 18,085 acres to be sold for three years back taxes aggregating $3,178.29, or at the rate of less than 6 cents per acre per year.

Social Conditions

It is a matter of universal observation, that, with such economic conditions as have been described, there is associated more or less social degeneracy, and many of the settlements show that this territory is no exception to the rule. Mental and physical defectives were commonly encountered, and the moral tone of some communities was very depressing. The explanation is traceable to the conditions of securing a livelihood, not to the people.

For the same reason the status of education is, in the majority of the townships, far from satisfactory. Sparse settlements with meagre returns from the soil make the efficient maintenance of schools very difficult. In some schools the teachers were found to be professionally unqualified, other schools were found closed, and, in other cases, the dwindling of the settlement is making the financial up-keep too heavy for those remaining.

The impression received daily throughout the season's investigation was the dreary hopelessness of attempting to secure returns by agricultural activities, from a soil inherently adapted only for forest use. The amount of human energy unavailingly expended in this attempt, represents an incalculable asset lost to the Province. It is but another example of past misguided or rather *unguided* occupancy of townships which should never have been thrown open for settlement, and of the lack of appreciation by Government of its obvious duties.

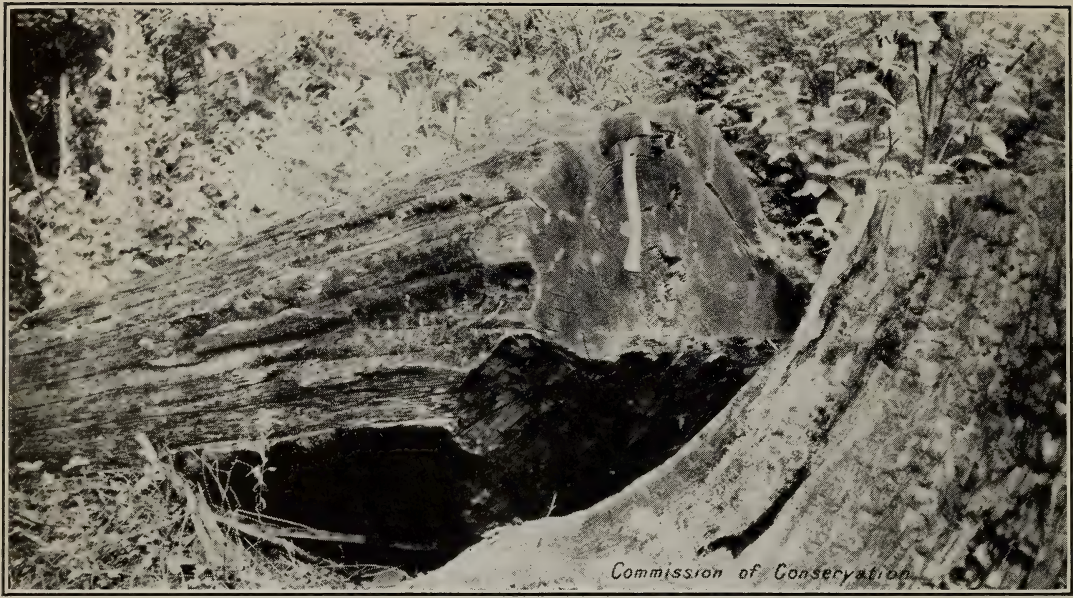
Early Advice—That this was not done through ignorance of conditions is shown by various reports of the early Commissioners of Crown Lands and of Parliamentary inquiries. Extracts from two of these will suffice to show that, even in those days, there were men who were aware of the necessity of segregating agricultural from absolute forest lands, and the setting aside of the latter as forest reserves. As early as 1855 a committee of the House of Commons, Hon. A. T. Galt, Chairman, reported, among other things : "It appears from the evidence that settlement has been unreasonably pushed in some localities quite unfit to become the permanent residence of an agricultural population. Especially has this been the case in some of the Free Grant roads and adjacent country, lying between the waters of the Ottawa and Lake Ontario. Your Committee would refer to the evidence and recommend that the Government should, in all cases, ascertain positively the character of the country before throwing open any tract of land for settlement, so that such lands that are really not fit for profitable cultivation may not be thrown upon the market. There being considerable diversity of opinion among the witnesses in regard to some of the localities adverted to, it seems to the committee that the Government should have an examination made by some thoroughly competent and reliable officer, whose report would be available in any further consideration of this subject."

Again, in 1865, the Hon. A. Campbell, Commissioner of Crown Lands, in his report for that year, stated : "Though much of it (the pine country) has been denuded of its valuable timber, it is the opinion of the best informed, that a large area remains untouched ; happily for the interests of the country, the pine exists on lands for the most part unfit for settlement. It needs a careful discrimination between pine lands exclusively and lands fit for settlement, to place it in the power of the Government to conserve this valuable source of national wealth. Should the whole of our uncultivatable land be set apart, as I think should be done, as a pine region, and no sales made there, the land would, if the trees were cut under a system of rotation such as is now adopted in Norway and Sweden and in many of the German States, recuperate their growth of merchantable pine in cycles of 30 and 40 years, and pine growing might be continued and preserved for ages to come. In view of the future requirements of this continent and of Europe, and of the singular advantages Canada enjoys as a pine-producing country, I humbly submit that it is of the utmost importance that we should now take steps in this direction."

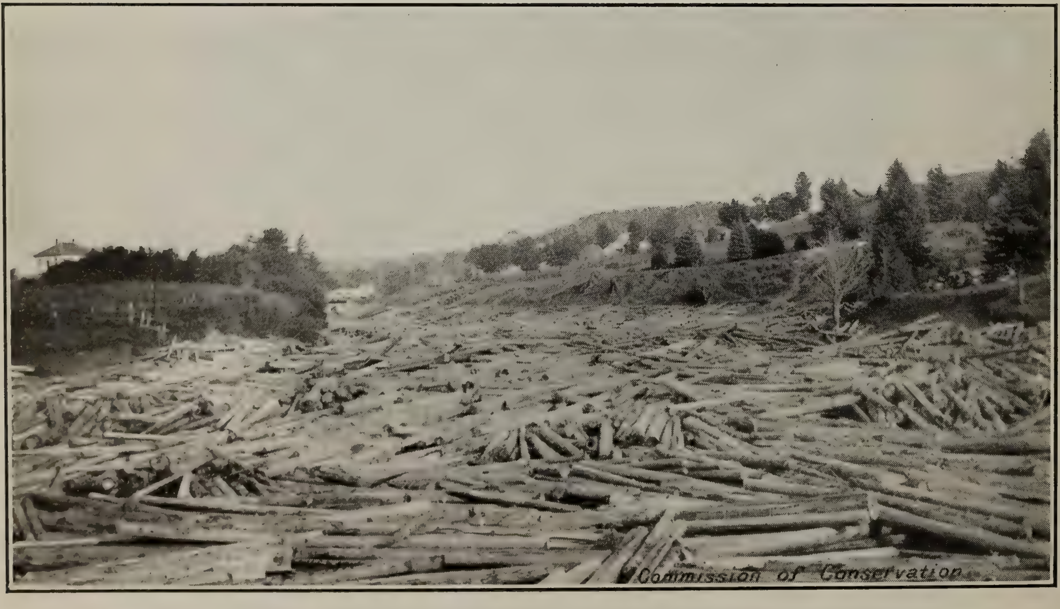
If the warnings of such men had been heeded it would have been better for the prosperity of Ontario.

Lumbering Conditions

In former times, the region under consideration lay within the southern fringe of the vast pinery that covered the southern slope of the Laurentian shield. In nearly all the townships, licenses had


Commission of Conservation

WHITE PINE LOG CUT 23 YEARS AGO AND LEFT AS DEFECTIVE ACCORDING TO STANDARDS AT THAT TIME
In certain townships there is still much material of this kind in the woods. In some cases, lumbermen are now hauling such logs to their mills


Commission of Conservation

THE PRESENT HARVEST. COMPARE SIZE OF THESE LOGS WITH THAT IN ILLUSTRATION ABOVE been issued in the early 'sixties,' and by the 'seventies' the lumbering industry was one of the first magnitude. During the season 1872-73, the cut of pine from this watershed amounted to some 120 million feet ; last season probably less than 10 million feet of pine were cut. The same season saw the close of operations by the largest pine lumbering concern of the region ; probably but four concerns remain able to scrape together a million feet of pine yearly. Five years will see the end of the pine so far as commercial quantities are concerned. With the exhaustion of the remaining softwood stands, mainly hemlock, in certain portions of Stanhope, Sherborne, Galway, Cavendish, and Anstruther, the lumbering of coniferous species will be practically at an end, and this will be within a decade. The present limit holders realize this and are buying all they can from settlers. One mill was found whose sole supply of logs came from discarded logs of former operations and pine 'rampikes' dead many years. It will be seen from the table on page 26 that the coniferous areas in existence constitute but 4.5 per cent of the forested area ; the areas of mixed composition likewise aggregate only 6.1 per cent ; and not all of either these two types is mature timber.

At present there are ten lumbering concerns whose operations within the watershed exceed one million feet of logs a year each. The total cut in 1911-12 was in the neighbourhood of 40 to 45 million feet, distributed approximately as follows : pine 40 per cent, hemlock 20 per cent, with small amounts of spruce, basswood, ash, elm, cedar, birch, balsam, maple, tamarack and beech. Probably 10 million feet of this came from the semi-virgin townships in the north owned in fee simple, with which we are not here concerned. As already intimated, the 1912-13 cut will show much less pine. The bulk of the logs are sawed at Marmora, Peterborough, Lakefield, Lindsay, and Coboconk.

Besides the saw-log industry there is a small production of cedar poles, posts and cross ties, shipped principally from Coehill, Kinmount and Haliburton. But the opinions of those engaged in the business confirm the field observations that the cedar swamps are nearly exhausted. Cedar is a species of such slow growth that its extinction, commercially, is unavoidable.

A small amount, probably not over 3,000 cords of spruce, balsam and poplar, cut by settlers, is shipped out of the region, mostly from Kinmount and Gooderham, for manufacture into pulp and paper. Some of this goes to Campbellford, Thorold, etc., but the bulk of it goes to Pennsylvania despite the long transportation. This is probably owing to the fact that the majority of the Ontario mills possess their own limits. During the past season the average prices paid the settler were $4 per cord for poplar, and $5.50 for spruce and balsam.

In addition to the pulpwood there is a small trade in basswood and poplar for excelsior, and cordwood for fuel, to various Ontario towns and cities, as well as a small quantity of tanbark, which is shipped to factories at Acton, Toronto and Omemee. An example of close utilization is seen in the shipment of fire-killed pine, with cull pine and hemlock, to Toronto brickyards, from certain points along the Haliburton branch of the Grand Trunk railway. There are also a few small cooperage plants at Marmora, Deer Lake, Glanmire and Kinmount, but elm, the species most largely used, is getting scarce.

In the wake of the lumbering operations, fire has followed, so that to-day over one-half (57.3 per cent) of the forested area is composed of poplar stands, the majority of them 15 to 30 years old. These, with the hardwood areas, which as yet have been but little exploited, constitute the future source of wood supply in this region. The hardwoods cover one-third of the total forested area.

The future of the lumbering of the region lies mainly in the utilization of the poplar and maple. Some of the lumbermen, when discussing with them the possibilities of future industrial development, claimed that the maple, owing to seam and black heart, is unprofitable. But it must be borne in mind that the handling of hardwood is a proposition of so different a nature from pine lumbering, that success cannot be expected where it is treated as a minor adjunct to a softwood business. Hardwoods as a whole are more defective, and the closest utilization of every log, not of maple only but of all the species, for the particular product for which it is best suited, is necessary to secure proper returns in the hardwood business. The field for the development of local minor wood-using industries, especially the manufacture of small woodenware, has not, as yet, been developed, although waterpower is available everywhere.

The other species, poplar, now covering some 560,000 acres as a result of past fires, will, in the course of 15 to 20 years be mature, and ready for manufacture into pulp, matchwood, etc. It represents a forest resource of great value, not only owing to the great quantity in almost pure stands, but also on account of the favourable conditions of transportation and water-power manufacture.

Despite the deterioration during the last forty years in the character of the forested area of the Trent watershed this region still possesses much forest wealth—one worthy of conservation by progressive methods of treatment.

Tourist Traffic Conditions

From the climatic and scenic standpoints, central and northern Ontario will always attract their share of summer tourists. In the Trent watershed, with the exception of the Kawartha Lakes region, this traffic is undeveloped. This region is very accessible, with the lakes dotted with islands. Practically all of these islands, especially in Stony lake, are the sites of summer homes to which the cottagers return yearly for the hot season. In addition to this class, the transient tourists find accommodation at the numerous summer hotels scattered along the Trent Canal system, notably at Mt. Julian, Burleigh Falls, Buckhorn, Bobcaygeon, Fenelon Falls, Rosedale, etc.

The townships to the north of these lakes offer unknown possibilities in this respect. A glance at the Forest Distribution map shows that all contain numerous lakes for camping purposes. These are well wooded, mostly with hardwood in the northern and poplar in the southern portion, with plenty of fishing, and with a connecting net-work of streams for canoeing. Some of them are not very accessible as yet, but with many people this is an added asset. The altitude throughout the region precludes any hot weather, and the nights are always cool. The region is particularly an inexpensive recreation ground for the great mass of urban citizens who have but a short vacation in which to tone up.

Ownership Conditions

A classification upon the basis of ownership of the land area here considered gives approximately the following figures :

(1)	Under license to cut timber last season	450 sq. miles
(2)	Old licenses reverted to the Crown	275 sq. miles
(3)	Owned in fee simple in large holdings	340 sq. miles

The land held in fee simple presents the unusual aspect of two corporations alone owning some 218,000 acres of it. The Canada Copper Company owns some 67,000 acres in the eastern portion of the watershed in the townships of Faraday, Wollaston, Limerick and Tudor ; some of this, however, is in the Moira River watershed. The Canadian Land and Immigration Company owns nine townships in the northern portion adjacent to Algonquin Park, some 17,000 acres of it tributary to Trent waters. These were grants given, in early days, at a nominal price per acre, for colonization purposes.

Settlement within the region concerned is at an end though the locating of single lots is still in vogue to a slight extent. The locators usually finish with them within three years, and then abandon them without having paid any taxes to the municipality. The licensed land carries only timber privileges, the land itself remaining provincial property. On the map showing ownership conditions the outstanding feature to be noted is the large amount of logged out land in the hands of the Crown. It must also be taken into account that, as the commercial timber will be exhausted within the next decade, the bulk of the area at present under license will revert gradually to the Crown. Furthermore, the licensed lands adjoin lands already in the possession of the Crown. Such a condition of block ownership facilitates any management that the Crown may deem expedient to undertake.

Appendix I

Notes on the Lumbering Industry in the Trent Watershed

Mr. J. B. McWilliams, for many years Crown Timber Agent in the region, has compiled from the records of the Department of Lands and Forests of the Province, the data in part, upon which the "Ownership" map has been based, and has furnished, in addition, interesting historical and local data, of which the following are reproduced :

Original Licenses

Anson.—The first license in Anson was issued to Walter Gowan, season 1861-62, area 28¼ square miles. No bonus paid.

Anstruther.—The first licenses in Anstruther were issued to R. H. Scott, season 1862-63, area 44½ square miles. No bonus paid. To A. H. Campbell, season 1867-68, area 17¾ square miles. No bonus paid.

Belmont.—The first licenses in Belmont were issued to T. McCabe in 1866-67, area 6¼ square miles. No bonus paid. To William Sutherland, season 1875-76, area ¼ mile. Bonus paid $2.10.

Burleigh.—The first license in Burleigh (South Division) was issued to John Ludgate, season 1862-63, area 25 square miles. No bonus paid.

Cardiff.—The first licenses in Cardiff were issued to Sanford Baker, season 1863-64, area 50 square miles. No bonus paid. To Sanford Baker, 1863-64, area 28 square miles. No bonus paid. To Gilmour & Co. 1864-65, area 3¼ square miles. No bonus paid.

Cashel.—The first licenses in Cashel were issued to Sanford Baker, season 1860-61, area 9 square miles. No bonus paid. To Potts, Easton, Gilmour & Co., season 1862-63, area 41¼ square miles. No bonus paid.

Cavendish.—The first licenses in Cavendish were issued to Platt & Bissonnette, season 1862-63, area 57¼ square miles. No bonus paid. To Strickland Bros., season 1867-68, 8½ square miles. No bonus paid.

Chandos.—The first licenses in Chandos were issued to Gilmour & Co., season 1862-63, area 34¼ square miles. No bonus paid. To J. C. Hughson, season 1864-65, area 19¼ square miles. No bonus paid. To J. C. Hughson, season 1864-65, area 4¼ square miles. No bonus paid.

Galway.—The first licenses in Galway were issued to Gilmour & Co., season 1862-63, area 49 square miles. No bonus paid. To Matthew Thompson, season 1870-71, area one square mile. Bonus paid $4.00.

Glamorgan.—The first licenses in Glamorgan were issued to Mossom Boyd, season 1863-64, area 16¾ square miles. Bonus paid $33.35. To John R. Rodgers, season 1863-64, area 24¾ square miles. Bonus paid $25.20.

Harvey.—The first licenses were issued to John Langton, season 1855-56. area 16¾ square miles. No bonus paid. To John Langton, season 1862-63, area 7 square miles. No bonus paid. To Anderson & Paradis, season 1862-63, area 6 square miles. No bonus paid. To John Maloney, season 1862-63, area 2 square miles. No bonus paid. To James Cummins, season 1862-63, area 4 square miles. No bonus paid.

Lake.—The first licenses in Lake were issued to James Cummins, season 1862-63, area 36¼ square miles. No bonus paid. To James Cummins, season 1862-63, area 16¼ square miles. No bonus paid.

Limerick.—The first licenses in Limerick were issued to Sanford Baker, season 1860-61, area 5 square miles. No bonus paid. To Campbell & Gilmour Co., season 1862-63, area 41½ square miles. No bonus paid.

Lutterworth.—The first licenses in Lutterworth were issued to Gillis & McLaren, season 1862-63, area 14 square miles. No bonus paid. To Alex. Dennistoun, season 1862-63, area 7¼ square miles. No bonus paid. To R. H. Scott, season 1862-63, area 5½ square miles. No bonus paid. To Boyd, Smith & Co., season 1872-73, area 3¾ square miles. Bonus paid $44.10.

Marmora.—The first licenses in Marmora were issued to James Cummins, season 1862-63, area one square mile. No bonus paid. To A. S. Page Co., season 1866-67, area 3¼ square miles. Bonus paid $12.00.

Methuen.—The first licenses in Methuen were issued to James Cummins, season 1862-63, 39½ square miles. No bonus paid. To Cummins, McCabe *et al*, season 1862-63, area 56 square miles. No bonus paid. To Fowlds Bros., season 1862-63, area one square mile. No bonus paid.

Minden.—The first license in Minden was issued to R. C. Smith, season 1866-67, area 16¼ square miles. Bonus paid $38.57.

Monmouth.—The first licenses in Monmouth were issued to Mossom Boyd, season 1863-64, area 24¾ square miles. Bonus paid $33.35. To J. C. Hughson, season 1863-64, area 16¾ square miles. Bonus paid $37.36. To John R. Rodgers, season 1863-64, area 37¼ square miles. Bonus paid $38.57. To John R. Rodgers, season 1863-64, area 2¾ square miles. Bonus paid $23.60.

Sherborne.—The first licenses issued in Sherborne were to Ross & Co., season 1868-69, area 10¼ square miles. Bonus paid $519.25. To W. A. Scott, season 1869-70, area 10¾ square miles. Bonus paid $4.10.

Snowdon.—The first license in Snowdon was issued to Mossom Boyd, season 1862-63, area 45¼ square miles. No bonus paid.

Somerville.—The first license in Somerville was issued to Samuel Dickson, season 1863-64, area 4½ square miles. No bonus paid.

Stanhope.—The first licenses in Stanhope were issued to Samuel Dickson, season 1862-63, area 4¾ square miles. Bonus paid $323.29. To Samuel Dickson, season 1862-63, area 16¼ square miles. Bonus paid $57.60. To McDougall & Co., season 1862-63, area 25¼ square miles. No bonus paid.

Tudor.—The first licenses issued in Tudor were to James Cummins, season 1862-63, area 24½ square miles. No bonus paid; and to J. Lingham, season 1862-63, area 10¾ square miles. No bonus paid.

Wollaston.—The first license issued in Wollaston was to Harris, Bronson & Coleman, season 1860-61, area 75 square miles. No bonus paid.

LICENSES NOW IN FORCE

Anson.—Area 11 square miles, to Quincy Adams Lumber Co. (500 acres within watershed).

Anstruther.—Area	6	square	miles, to	Jackson &	Tindle Co.
"	1½	"	"	"	"
"	21¼	"	"	Peterborough Lumber Co.	
"	5¾	"	"	"	"
"	38½	"	"	"	"

Burleigh (North Division).—Area	10½	sq.	miles, to	Alfred McDonald estate.	
	" 30½	"	"	Peterborough	Lumber Co.
(South Division).—	" 8¼	"	"	"	"

Cardiff.—Area 3¼ square miles, to Gill and Fortune.
“ 6 “ “ Peterborough Lumber Co.
“ 44 “ “ Rathbun Co. (abandoned ?)
“ 28 “ “ Spears and Lander.

Cashel.—Area 9 square miles, to Rathbun Co. (part outside watershed)
“ 8½ “ “ George B. Ferguson (outside watershed)
“ 41¼ “ “ Gill & Fortune (some patented lots included)

Cavendish.—Area 2 square miles, to Jackson & Tindle.
“ 12 “ “ “ “
“ 8¼ “ “ “ “
“ 33¼ “ “ Peterborough Lumber Co.

Chandos.—Area 4¼ square miles, to Alfred McDonald Estate
“ ¼ “ “ “ “ “
“ 4 “ “ Rathbun Co. (abandoned ?)
“ 18¾ “ “ James Thompson (abandoned ?, part patented)

Galway.—Area 49 square miles, to Alfred McDonald Estate.

Glamorgan.—Area 8¼ square miles, to Jackson & Tindle.
“ 18¾ “ “ Woods Product Co.
“ 6 “ “ “ “ “
“ 2½ “ “ Mrs. Alice Hunter.

Harvey.—Area 8¾ square miles, to Mossom Boyd Co. } These
“ 4 “ “ Alfred McDonald Estate } nearly all
“ 1¼ “ “ “ “ “ } patented
“ 6 “ “ Peterborough Lumber Co. Two-thirds of this patented.
“ 3½ “ “ John Carew Lumber Co.
“ 28 “ “ “ “ “

Lake.—Area 16¼ square miles, to Rathbun Co. (abandoned—only 5,000 acres of this unpatented.)
“ 36¼ “ “ Pearce Co. (6,800 acres of this patented).

Marmora.—Area 3¼ square miles, to Michael J. O'Brien (outside watershed).

Methuen.—Area 21 square miles, to Peterborough Lumber Co.
“ 35 “ “ Rathbun Co. { 4,500 ac. patented.
“ 39½ “ “ James Thompson { 4,300 “

Monmouth.—Area 6 square miles, to M. J. O'Hara { (abandoned — 1,100 ac.
“ 1¾ “ “ Jackson & Tindle { of this patented.)

Sherborne.—Area 4½ square miles, to Michael Dyment & Son { outside water-
“ 1½ “ “ “ “ “ { shed.
“ 10¼ “ “ Gull River Lumber Co.
(partly outside watershed)
“ 5 “ “ “ “ (outside watershed)

Stanhope.—Area 25¼ square miles, to Gull River Lumber Co. } (part patented)
“ 16¼ “ “ “ “ “ }

Tudor.—Area 3¼ square miles, to John Winters } (outside of watershed)
“ 10¾ “ “ Rathbun Co. }

To give some idea of the lumbering operations on the Trent waters 40 years ago, say 1872-73, an estimate of the pine lumber taken out that season by the principal operators, may be compared with the pine taken in same district during the past season. Gilmour & Company had a mill at Trenton and their output for the season of 1872-73 was about 22,000,000 feet B.M. Fowlds Bros. had a mill at Hastings and their output for the season 1872-73 was about 1,500,000 feet B.M. McDougall & Ludgate had a mill at Harwood, south side of Rice lake, and their output for season 1872-73 was about 10,000,000 feet B.M. Ullyott, Saddler & Company had a mill at Harwood, and their output for season 1872-73 was about 12,000,000 feet B.M. The Dickson Company had a mill at Peterborough and their output for season 1872-73 was about 5,000,000 feet B.M. George Hilliard had a mill in Peterborough and his output for season 1872-73 was about 4,000,000 feet B.M. John McDonald had a mill in Peterborough and his output for season 1872-73 was about 1,500,000 feet B.M. James Z. Rogers had a mill in Ashburnham, now the east ward of the city of Peterborough, and his output for the season 1872-73 was about 1,000,000 feet B.M. Boyd Smith & Company had a mill at Nassau, three miles north of Peterborough and their output for the season 1872-73 was about 6,000,000 feet B.M. R. S. Strickland & Company had a mill at Lakefield and their output for season 1872-73 was about 4,000,000 feet B.M. N. Shaw had a mill at Buckhorn and his output for season 1872-73 was about 2,000,000 feet B.M. W. A. Scott had a mill on the Mississauga, 2 miles north of Buckhorn, and his output for season 1872-73 was about 5,000,000 feet B.M. Mossom Boyd had a mill at Bobcaygeon and his output for season 1872-73 was about 10,000,000 feet B.M. J. D. Smith & Company had a mill at Fenelon Falls and their output for season 1872-73 was about 9,000,000 feet B. M. Hilliard & Mowry had a mill at Fenelon Falls, and their output for season 1872-73 was about 4,000,000 feet B.M. Green & Ellis had a mill at Fenelon Falls, and their output for season 1872-73 was about 5,000,000 feet B.M. W. M. Snyder formerly had a mill in Peterborough and took out about 3,000,000 feet B.M., season of 1872-73, and had it sawn by contract. A. H. Campbell & Company, former owners of the Nassau mill, took out about 4,000,000 feet B.M., season 1872-73, and had the logs sawn by contract. Paxton, Bigelow & Trounce had a mill at Port Perry and their output for the season 1872-73 was about 5,000,000 feet B.M.

Besides the parties mentioned there were a large number of small operators taking out from 100,000 to 300,000 or 400,000 feet B.M. each, generally cut on private lands. Also a large quantity of square timber was taken out for the Quebec market by Gilmour & Company, Mossom Boyd, T. Buck, John McDonald, Matthew Reid, and Thompson & Cluxton. Not one of the parties mentioned above is engaged in the lumber business at the present time.

Compare that season's cut with the past season and you see how the lumbering business has fallen off in the Trent district. Last season the Cavendish Company took out about 8,500,000 feet of pine, which completes their cut of pine and they retire from business, having sold their other timber to the Peterborough Lumber Company.

The Peterborough Lumber Company, of Peterborough, took out last season about 300,000 feet B.M. of pine, besides their hemlock.

The Alfred McDonald Estate of Peterborough took out about 800,000 feet B.M. of pine.

The Pierce Company, of Marmora, took out about 450,000 feet B.M. of pine.

Mr. Phillips of Burnt River took out about 110,000 feet B.M. of pine.

The Cavendish Lumber Company have cleaned up the last pine timber limit of any value in this district, and, in the future, only a small quantity can be taken out, principally scattered trees.

CUT OF PINE, SEASON 1872-73

Operator	Mill	Cut Feet B.M.
Gilmour & Co.	Trenton	22,000,000
Fowlds Bros.	Hastings	1,500,000
McDougall & Ludgate	Harwood	10,000,000
Ullyott, Sadler & Co.	”	12,000,000
Dickson Co.	Peterborough	5,000,000
Geo. Hilliard	“	4,000,000
John McDonald	“	1,500,000
Jas. Z. Rogers	Ashburnham	1,000,000
Boyd, Smith & Co.	Nassau	6,000,000
R. S. Strickland & Co.	Lakefield	4,000,000
N. Shaw	Buckhorn	2,000,000
W. A. Scott	Mississagua River	5,000,000
Mossom Boyd	Bobcaygeon	10,000,000
J. D. Smith & Co.	Fenelon Falls	9,000,000
Hilliard & Mowry	“ “	4,000,000
Green & Ellis	“ “	5,000,000
W. M. Snyder	Sawn by contract	3,000,000
A. H. Campbell & Co.		4,000,000
Paxton, Bigelow & Trounce	Port Perry	5,000,000
		117,000,000

In addition to the foregoing, there is the unenumerated cut of small operators and the cut of square timber for the Quebec market, figures for which are not available.

CUT OF PINE, SEASON OF 1911–12.

Cavendish Co.		8,500,000
Peterborough Lumber Co.	Peterborough	300,000
Alfred McDonald Estate	“	800,000
Pearce Co.	Marmora	450,000
Phillips	Burnt River	110,000
		10,160,000

The Crown timber regulations of 1849 fixed the dues at a half-penny (1c.) per cubic foot of square white pine, and fivepence (10c.) per log 12 feet long, any diameter.

In 1852, new regulations were made; square white pine was left at the half-penny rate, but the pine logs increased to sevenpence (14c.)

In 1856, another change was made and square pine left at the half-penny and pine logs at six pence per log 13½ feet long, any diameter, or 10 cents per standard log 13½ feet long by 20 inches in diameter.

In 1869, new regulations were made; square white pine was charged 1¼ cents per cubic foot and 15 cents a standard of 200 feet, or 75 cents per 1,000 feet.

In 1887, the dues on pine were increased; square white pine was charged 2 cents and pine lumber $1.00 per 1000 feet.

Appendix II

Physical Features of the Area *

The general character of the surface of the area embraced by the map accompanying this report is constant throughout its entire extent, and forming as it does, a portion of the great Canadian Shield, or Northern Protaxis of America, its features are those presented by this great region in most other places. Here the country is a great plain, rendered somewhat uneven by depressions worn in its surface, and which are now occupied by a great number of lakes and streams. While the term peneplain is a convenient one to apply to this great stretch of country with its distinctive physiographic features, it may perhaps be more accurately designated simply as a somewhat dissected plain. From the surface of the plain, in a few places, there rise low, rounded hills or monadnocks, forming pronounced features of the landscape.

Owing to the depressions, and the hills in question, the country presents to the casual observer a rolling or hilly character, but that it really is a plateau or elevated plain, which has been etched or dissected by the agencies of decay and erosion, is evident from a study of the landscape as seen from any of the higher points in the area, as for instance, from the summit of Greens mountain, on lots 15 and 16, concession I of the township of Glamorgan, which is 1,466 feet above sea-level, and from which an uninterrupted view of the surrounding country can be obtained in all directions as far as the eye can reach. The sky-line from here is seen to be flat and even around the whole horizon, its uniformity being broken only by three or four low hills, rising from the plain in different directions. To the north and west the sky-line appears absolutely flat. The hills constituting the unevennesses in the sky-line are, like Greens mountain itself, composed of masses of harder rock, which remain by virtue of the resistance which they offer to erosion. Thus, the most noticeable of the little humps on the sky-line, as seen from Greens mountain, is a group of hills composed of granite, which forms part of the Anstruther batholith, and is situated on concession v of Monmouth. Another is formed by a ridge of dioritic rock, which is crossed by the Monck road in the eastern portion of the same township. Another slight unevenness in the sky-line is caused by a granitic mass north of McCue lake, in the same township. The same even sky-line is well seen from the higher points in the central and southern portions of the township of Anson, or from any of the higher elevations in the townships of Dysart, Harburn, or Bruton. It is also very distinctly seen from the Hastings road, just south of McKenzie lake, on the line between the townships of Lyell and Wicklow. In the southern portion of the area, the same even sky-line, broken only by a very few low, isolated hills, can be observed from the top of the Blue mountains in the township of Methuen, or from the higher points in the great dioritic intrusion occupying the central portion of the township of Lake.

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* Reprinted nearly *verbatim* from *Geology of the Haliburton and Bancroft Areas, Province of Ontario.* By Frank D. Adams and Alfred E. Barlow. Geological Survey Branch, Department of Mines, Canada, 1910.

Although, however, when viewed from any particular point, this plain appears very even, its surface is not quite horizontal. From the southwestern portion of the area the plain rises gently, on going north, until an area of maximum elevation is reached, beyond which it slopes gradually down toward the north, or northeast again. This area of maximum elevation is situated beyond the northern boundary of the sheet. This constitutes the watershed of the region, the waters from it being carried off to the south in a number of small rivers, into large lakes, which lie to the south and west, beyond the limits of the map, and thence into the St. Lawrence ; while along the northern slope it is drained by a number of little streams, which unite to form the Madawaska river.

The heights of all the points in the area whose elevations have been determined—some 120 in number—have been recorded on the map. The elevations being chiefly of points along lines of railway are, naturally, somewhat lower than they would be for adjacent points on the surface of the plain, the railways following, so far as possible, lines of depression.

The average height of the plain, as a whole, in the area covered by the map, may be taken as about 1,250 feet above sea-level. In the higher tract referred to above and forming the watershed, it is about 1,500 feet. So far as known, the highest point in the area is on the Hastings road, about six miles north of Maynooth, in the township of Wicklow, which was determined barometrically to be 1,570 feet above sea-level.

In the southern portion of the map, the plain continues to slope gently to the south, and eventually passes beneath the Palæozoic strata which here border it. The lowest points in the whole district are along this contact, Stony lake being only 768 feet, and Deer bay 793 feet above sea-level ; while the roadbed of the Central Ontario railway, which, crossing concession XIV of Tudor, is 1,035 feet above sea-level, sinks to 944 at Millbridge station, and to 828 at Bannockburn station, four miles and a half farther south.

The average gradient of the southward sloping portion of the plain cannot be certainly determined with the data at present available, the exact height of a sufficient number of points not being known. If, however, a line is taken from the height-of-land which forms the divide between the Muskoka and Madawaska rivers, in the township of Peck (1,500 feet), in a direction S. 19° E. to the surface of the plain at a point two miles south of Gooderham (1,213 feet), in the township of Glamorgan—a distance of 46 miles—the gradient will be found to be 6.4 feet to the mile. If a longer line is taken, running a little to the west of that just mentioned and parallel to it, from Canoe lake in the township of Peck (1,379 feet), to Deer bay (793 feet), in the township of Harvey, at the extreme southern limit of the map, the total descent will be 586 feet, and the gradient 8.1 feet to the mile.

These figures probably represent very closely the average southerly gradient, except along the easterly margin of the area, where the plain, as shown above, has a more uniform elevation from north to south.

The plain, as has been mentioned, presents by no means a perfectly even surface. It has been etched by the agents of erosion, and is thus pitted and scored. In these depressions lie the lakes, which are so abundant in the area, or in some cases swamps, and the streams and rivers which connect and drain them. The accentuation of the country is, however, very low, and it is very seldom indeed in any portion of the area that the hills whose summits represent the plain rise as much as 250 feet above the waters of the lake or river at their foot. In by far the greater number of cases the difference in level is much less than this. The greatest difference in level of any two points on the map, so far as known at present, is 639 feet, the highest point being that north of Maynooth, referred to above, and the lowest being the surface of lake Kamaniskeg, lot 12, concession XIX, in the township of Raglan. If the depth of the waters of this lake were added to the figure given above, the maximum difference in level to be found in the area covered by the map would probably be obtained.

At some points in the area, as has been mentioned, isolated hills, or small groups of hills, forming notable features in the landscape of the surrounding district, rise above the general surface of the plain. These, as has been mentioned, are usually composed of some more resistant rock, and survive on account of the greater resistance which they offer to the action of the forces of denudation. One of these already mentioned—Greens mountain—on lots 15 and 16, concession I of Glamorgan, rises 1,466 feet above sea-level, or 253 feet above the level of the surface of the surrounding plain, and is composed of a massive gabbro. Another, made up of syenite, is known as the Blue mountain, and is situated in the central part of the township of Methuen. It is, at its highest part, 300 feet above the surface of Kasshabog lake, which lies immediately south of it, or about 1,100 feet above sea-level. Its height above the plain, in a shallow depression of which the lake lies, would thus be somewhat greater than that of Greens mountain, although its height above sea-level is considerably less.

Along the southern margin of the map area also, conspicuous hills are formed by the isolated outliers of the horizontal Palæozoic strata of the great plain of central Canada, which bounds the Archæan country on the south. These Palæozoic strata formerly completely covered this Archæan country, along its southern portion at least, the surface of what we may term the Archæan plain being seen to pass beneath them. Now that the strata in question have been almost entirely stripped off, and the underlying Archæan (or pre-Palæozoic) plain is once more laid bare, these surviving remnants of the Palæozoic stand up from the surrounding Archæan country as steep-faced hills, composed of horizontally bedded limestones, and which can be seen for long distances.

The plain is almost everywhere more or less mantled by drift, the ice of the glacial period being the latest agent of erosion. The thickness of this drift varies considerably in different places. Over the greater portion of the area it is comparatively thin, so that, while it forms the soil of the country, the underlying rock, in the form of smooth *roches moutonnées*, protrudes through it at frequent intervals, giving ample opportunity for a study of the petrographical character, and the structure of the rocks beneath. In some districts, however, the drift is heavier, and forms an almost continuous covering, no exposures being visible for long. distances. Areas of heavy drift are found in the northern portions of the townships of Dysart, Anstruther, and the southeastern portion of Carlow. The drift in these stretches of country, and generally everywhere at the higher levels throughout the area, is unstratified and filled with boulders, the stratified gravels and sands being found about the lakes, and in the river valleys. The drift undoubtedly gives to the plain a somewhat smoother surface than it would present were the surface freed from drift, although the accentuation of the country is probably not decreased by its presence, to any considerable extent ; for, while the drift undoubtedly fills many depressions in the subjacent rock surface, it also mantles and thus increases the elevation of many of the highest portions of the area. When the drift is very thin and disconnected, or when, as in a few places, it is absent, the country assumes a very rocky and barren aspect, great expanses of bare *roches moutonnées* surface extending in every direction. Such tracts are almost exclusively confined to certain developments of granite or diorite, as for instance, those crossed by the Buckhorn road in the township of Glamorgan, or by the Hastings road in the townships of Wollaston and Limerick. Similar drift-free areas are seen in the great Blueberry 'barrens' in southeastern Methuen, as well as in the diorite and granite areas of Cashel and Grimsthorpe. The thinness of the drift sheet, or the absence of drift, in the case of the granitic or dioritic areas, is due in part to the fact, that, being composed of rocks which offer a marked resistance to erosion, these areas stand at relatively high levels, while most of the other rocks of the district, being somewhat softer, are apt to form the depressions in the plain, and are there likely to be more or less covered by drift. This cause, however, by no means determines the distribution of the drift in all cases, for, as has been shown, many great stretches of granite, forming the higher portions of the area, lie under an almost continuous mantle of drift.

One of the most characteristic features of the landscape of this region, as of most other parts of the great northern protaxis in Canada, is the immense number of lakes, large and small, which stud its surface. Some 500 lakes occur in the area of 4,000 square miles embraced by the map which accompanies this report, or one lake to about every 8 square miles of surface. These lakes range in size from comparatively large bodies of water, like Kawagama lake, which has an area of about 22 square miles, down to very small lakes or ponds, which cover only a small fraction of a square mile. These lakes are filled with beautifully clear and fresh water, and discharge through the multitude of streams and little rivers, which, with them, constitute the drainage system of the district, and along the course of which are many beautiful waterfalls, supplying ample power to mills at various points. By means of these hundreds of lakes and their connecting streams, it is possible, if the routes be known, to traverse the area in canoes in almost any direction, without making portages of any great length. Thus, there is a good canoe route from Gull lake, in the southwestern portion of the area, northward through the township of Minden to Whitney on the line of the Grand Trunk railway, and thence south through Baptiste lake to Bancroft, on the Central Ontario railway. From thence there is a canoe route to the northeast, down the York branch of the Madawaska, to beyond the limits of the sheet. While thus it is often very difficult, except for the experienced woodsman, to traverse the forests of the unsettled portions of the country on foot, the district is admirably suited for canoe travel, and, by means of canoes, access may be had to any part of it.

The lakes, which are so numerous in this tract of country, occupying, as has been shown, shallow depressions in the plain, are, in some cases, true rock basins, and, in other cases, depressions in the mantle of drift. Other lakes have banks which are in part rock and, in part, drift, occupying, in some instances, portions of a rock basin which has been partitioned off, or partly filled up by a mass of drift.
A striking example of a rock basin is that occupied by Clear lake, in the southeastern corner of the township of Sherborne. Still other excellent examples are afforded by Compass lake and Stoplog lake, situated in the granite country forming the western side of the township of Burleigh. This tract of country is free from drift, and consists of a series of low ridges of granite running with the strike of the gneiss, in the depressions of which lie little lakes. Another peculiar example is to be found in a narrow lake, nearly two miles long, crossing concessions XII, XIII, and XIV on the west side of the township of Lutterworth, this lake depression being remarkable in that it cuts directly across the strike of the gneiss in which it is excavated, throughout its whole length.

As an instance of lakes which lie in depressions in the drift, the two lakes situated on lots 25, 26 and 27, of concessions X, XI, and XII of the township of Harcourt, may be cited. They lie in a sandy pine flat, which has an elevation of only a few feet above their waters, and which is continuous with that through which the branch of the York river draining these lakes flows, both to the north and south of the lakes in question. Another lake about which very little rock is exposed, and which may be said to occupy a drift depression, is Clearwater lake in the township of McClintock. Oxtongue lake, in the same township, as well as Beech and Maple lakes, in the township of Stanhope, are in like manner almost entirely bordered by drift. Head lake, by the side of which the village of Haliburton is situated, and many other sheets of water in the area, have no rock exposed about their margins.

Furthermore, it can be clearly seen from the surface features of the country, that, in many cases, groups of these lakes, which are now separate sheets of water, were at one time connected. The low flats of stratified sand which separate them are clearly portions of the lake bottom when the water stood at a somewhat higher level than at present, while the higher land, which formed the original lake shores, can be seen in the background bordering the plain.

Thus, in the southern portion of the township of Dysart, Head lake, Grass lake, and the little lake immediately to the south of the latter sheet of water, were at one time connected with each other, and, with Lake Kashagawigamog. In the same way, Drag lake formerly extended to the southwest across the sand flat on concessions IV, V, and VI of Dysart, to Long lake, on concession I of Dysart. Drag lake was thus formerly at least twice as large as it is at present, and probably extended to the west from Blue Hawk lake, down the valley of the Burnt river, which would give it a still larger area. Many other similar instances may be observed in all parts of the area.

The drift, however, is comparatively thin everywhere, and the depressions in its surface probably, in many cases, mark equivalent depressions in the surface of the underlying gneiss, and thus a glance at the map shows the remarkable influence which the strike of the rocks underlying the area has had upon the distribution, position, and shape of the lakes, and upon the course of the streams. In the southern portion of the area the lakes lie very largely along the course of the bands of Grenville limestone, while, in the granite region of the north, they form a delicately etched pattern of the surface of the great plain of granitic gneiss, occupying shallow depressions, whose course is determined chiefly by the strike of the country rock ; and, even when the lake runs across the strike, the long arms and bays in its deeply indented shore line will be found to follow the direction of the strike.

The group of lakes in the townships of Nightingale, Clyde, Sabine, and Lawrence show in a striking manner how the shape of the lakes is determined by the complicated twisting of the strikes in that district.

Appendix III

Geology of the Area*

The region is a very typical Archæan or Pre-Cambrian area, near the southern margin of the great Canadian Shield or Northern Protaxis of the North American continent, which stretches with almost unbroken continuity to the borders of the Arctic ocean. Ordovician strata, which survive as evidence of the transgression of the Palæozoic sea from the south occur as isolated outliers of various sizes and shapes. They form conspicuous steep-faced hills of horizontally stratified rocks in the townships of Lake, Methuen, Burleigh and Harvey, in the south-west angle of the Bancroft sheet. To the south of Stony lake, the northern portions of Dummer and Smith townships are underlain by the main body of the Ordovician, which forms the great plain stretching southward to lake Ontario and beyond.

The line of contact between the highly inclined crystalline rocks of the Pre-Cambrian and the horizontal limestones and sandstones of the Palæozoic is marked by a very distinct and abrupt change in the character of the country. The Pre-Cambrian region is decidedly rocky and uneven and is thus, in large part, unsuited for purposes of agriculture. It is pre-eminently a grazing country with stretches of uncleared forest land still remaining. In marked contrast the country underlain by Ordovician strata is prevailingly flat and fertile, well cleared, and occupied by a large farming population.

In the area covered by the Forest Distribution map, the Laurentian country is underlain by a diversified series of altered sedimentary rocks among which limestones predominate, resting upon and invaded by enormous bodies of gneissic granite.

The sedimentary series is largely developed to the south-east, where it is comparatively free from igneous intrusions. Towards the north-west, however, the granite, in ever-increasing amount, arches up the sedimentary series and wells up through it, in places disintegrating it into a breccia composed of shreds and patches of the invaded rock scattered through the invading granite, until eventually connected areas of the sedimentary series disappear entirely and over hundreds of square miles, the granite and granite-gneiss alone are seen, holding, however, in almost every exposure, inclusions which represent the last scattered remnants of the invaded rock. In addition to these extensive batholiths of granite and gneiss, other rocks of an intrusive character occur. Among the more important may be mentioned gabbros, diorites and amphibolites, in addition to nepheline and other alkaline syenites, with which the corundum deposits are associated.

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*Extracted from Guide Book No. 2, International Geological Congress, 1913

Appendix IV*

Mineral Occurrences in the Area included in the Trent Watershed Map

Gold

The Belmont or Cordova mine, operated by the Cordova Exploration Co., has been opened on lot 20, concession I of Belmont.

The Deloro mine, formerly known as the Canada Consolidated, is the most important gold mine in central Canada and is situated in lots 9 and 10, concession VIII of Marmora. The ore consists of mispickel or arsenical pyrites, with gold in quartz. This mine is almost unique in that it produces both arsenic and gold.

The Richardson mine on lot 18, concession V of Madoc caused the noted Madoc gold excitement of 1866 and following years. It proved, however, to be a small, though very rich, pocket.

Gold was discovered on many other properties in Madoc and Marmora. It has also been mined in a small way, on the following :

Belmont —lot 18, concession III
Tudor —lots 4, 5, " III ; Craig mine
Grimsthorpe —lot 30, " IX

Copper

A copper-bearing vein has been opened on lot 22, concession III of Dungannon.

Galena

Galena has been mined in a number of localities. Concerning some of them Vennor says : "It may be remarked that many of these veins in Tudor, yielding considerable bunches of ore near the surface, show little more than traces of ore at the depth of a few feet."

It has been mined on some 25 lots in Tudor and in the following localities :

Lake —lot 6, concession XI ; Katherine mine
" — " 8, " XI
" — " 10, " XI : Donahue mine
" — " 11, " XI
Madoc — " A, " VI ; Hollandia mine

Molybdenum

Molybdenite has been found in the following localities :

Harcourt—on, or near, N.E. corner of lot, 3, concession I
Cardiff—about three miles southwest of Deer Lake Station
Digby—lot 6, concession VII
Lutterworth—lot 23, concession V
" —Miner bay, Gull lake
Monteagle—lots 6, 26 and 27, concession I
Anstruther—lot 24 (or 25), concession XIV

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*Note—The notes contained in this Appendix are, in large part, summarized from *Geology of the Haliburton and Bancroft Areas*, by Frank D. Adams and Alfred E. Barlow, except references to Madoc, Marmora and Belmont townships, which are from reports of the Geological Survey of Canada.

Iron

Iron ore has been mined extensively in the southwestern portion of the area covered by the map, notably the Bessemer mine in Mayo, the Wallbridge and Seymour mines in Madoc, the Blairton mine in Belmont, and the Coehill mine in Wollaston.

The most important occurrences are :

Burleigh —near Apsley village
Dungannon—lot 30, concession xiii
Glamorgan — " 27, " xv
" — " 35, " iv
" —lots 29,30,32 " i
" —lot 27, " xiii
Lake — " 18, " iii and iv
Lutterworth— " 5, " v and vi ; Paxton mine
Minden — " 11, " i
Monmouth — " 30, " xiii
Mayo —lots 2, 3, 4 " vi and lots 11
Snowdon —lot 20, " i ; Victoria mine
" —lots 25, 26, 27, concession iv
" —lot 33, concession v
Tudor — " 19, " xi ; St. Charles mine
" —lots 6, 7, 8 " xix ; Emily mine
" —lot 18, " xviii ; Baker or Horseshoe mine
" —lots 56, 57, Hastings Road West
Wollaston — " 12, 13, 14, 15, concession viii ; Coehill mine
Belmont — " 7, 8, concession i ; Blairton mine
" —lot 19, " i ; Ledyard mine

Also in some 26 localities in Madoc and Marmora townships.

Ochre

Ochre has been mined near the shore of Loon bay, Kawagama lake, concession xii, Sherbourne township.

Pyrite

There are deposits of pyrite in the following localities :

Cashel—lot 23, concession vii ; Little Salmon Lake
" " 23, " iv ; Gunter mine
Madoc—" 11, " xi

Mispickel

As stated under "Gold," the ore found at the Deloro mine contains mispickel. For a time, arsenic was produced there but, as it is a by-product of Cobalt ores, its production is no longer remunerative.

Mispickel has also been found in :

Faraday —in concession ix, about seven miles west of L'Amable station—the Best mine
Dungannon—Bradshaw lot in concession vi
Wollaston —Rollins lot, five miles west of Coehill

Mica

This mineral has been prospected or mined at a number of points as below :

Monmouth—lot 16, concession x
Cardiff — “ 7, “ xxii
“ — “ 30, “ xiii
Glamorgan— “ 35, “ i
Methuen — “ 15, “ vii ; Lynn mine
“ — “ 16, “ vii ; Osterhause mine

Talc

Talc is being mined and ground at Madoc village. It has also been mined on lot 9, concession v of Grimsthorpe. There is a very large market for this mineral as a filler for paper, etc.

Graphite

The following occurrences have been noted :

Monmouth —lot 9, Monck Road
“ — “ 32, concession xiii
Anstruther — “ 38, “ i
Glamorgan — “ 30, “ iv

Corundum

From an economic standpoint, corundum is one of the most important minerals in this area. There are a great number of corundum occurrences in the northeastern portion of the area, but only those in Carlow township have been developed to any extent.

The Ashland Emery & Corundum (formerly the Ontario Corundum) Company has mined it on lot 14, concession xiv, and lots 15 and 16, concession xiii of Carlow.

The Canada Corundum Co. formerly operated the Craig mine and other deposits covering an area of 2,000 acres in Renfrew and Hastings counties. This mine is now closed down, and, as the mine buildings have been destroyed by fire, it is improbable that it will be re-opened in the near future.

Other localities that have been prospected are :

Monteagle —lots 5 and 13, concession i
Dungannon— “ 6 and 7, “ xiv

Garnet

Crystals of garnet, usually about half-inch across, but, in some cases, an inch, or even more, in diameter have been noted on the east town-line of Cardiff at its intersection with the line between concessions vi and vii.

They are also found on Fishtail lake, lots 12 and 13, concession ix of Harcourt.

Apatite

Apatite is found at various points throughout the region, but the inaccessibility of much of the district, together with the low prices prevailing, have prevented the shipping of the material, although considerable development work has been done in the township of Monmouth, to the northwest of Tory Hill.

Apatite has been reported as occurring at the following localities :

Dudley —lot 4, concession III
Dysart — " 11, " v
Harcourt — " 21, " xi
Monmouth —lots 14, 15, and 17, concession xi
" —lot 3, concession x
Cardiff — " 8, " xvi
" — " 22, " xiv
" — " 22, " xix
Faraday —5 miles southwest of Bancroft
Monteagle —lot 26, concession vi

Marl

Much attention has been directed to deposits of marl because of the demand for it in the manufacture of Portland cement. These deposits are nearly pure carbonate of lime, with a greater or less admixture of certain impurities, mainly silica and organic material.

The more extensive and important deposit in the area is that which is still in process of deposition, covering the shores and the greater portion of the bottoms of the Blue Sea lakes, in concessions xii and xiii of Limerick. The other deposits form the bottom of Snow lake, lot 24, concession ix of Wollaston. The depth of the marl was in neither case ascertained, but it is very evidently of such extent as to be available for economic purposes.

Marble

An unlimited supply of various marbles can be obtained in this district. Only a few places have been opened for ornamental stone, but these examinations were sufficient to show that marbles of various colours and textures, equal to the best imported material, could be obtained. Large blocks, free from flaws and shakes, suitable for columns of any size can be quarried, and as transporation facilities are adequate, stone could be put on the market in large centres, such as Toronto, Ottawa, and Montreal, at prices much lower than those obtaining for imported marbles.

On lots 1 and 2 ,concession xii of Faraday township, a great deal of work has been done in opening up a marble quarry.

The presence of good workable marble has here been proved, over an area more than half a mile long by some 1,000 feet wide. Stone can be obtained ranging from a coarse crystalline white marble to a grayish, dove coloured, fine-grained stone ; variegated and veined marbles have also been uncovered.

The Ontario Marble Quarries, Ltd., have opened up a quarry on lots 41 and 42, Hastings Road East in Faraday. At least four varieties of marble can be obtained in different parts of the area.

Other marbles deposits have been noted in many localities including:

Faraday—lots 41 and 42, Hastings Road West
Dungannon—lots 26, 27, 28, 29, 30, concession x
Lutterworth—lot 19, concessions iv and v
" " 20, concession v
Glamorgan—lot 2, " vi

Serpentine marble is found in:

Lutterworth—lot 13, concession xiv

Lithographic Stone

A fine grained limestone that makes an excellent lithographic stone has been quarried on lots 7 and 8, concession v of Madoc. Owing to the limited market in Canada, production has not, as yet, been undertaken on a commercial scale.

Sodalite

On lot 25, concession xiv of Dungannon, some considerable development work and quarrying have been done on a body of sodalite, which it is intended to work extensively for a decorative stone. This mineral which has a beautiful blue colour, ranging from a dark shade to a very pale blue, takes a high polish, and is eminently fitted to be used as ornamental stone of high grade.

In this deposit of sodalite, more particularly near the edges where it merges into the nepheline rocks, there are patches of aventurine feldspur or sunstone, which can be polished and used as a semi-precious stone.

Immediately south of the above, there is another occurrence of sodalite on lot 25, concession xiii, township of Dungannon.

Appendix V

Extracts from Letters of Township Clerks and Reeves to the Dominion Forestry Branch Regarding Conditions in the Trent Watershed and Neighbouring Counties

Before the survey was begun, the Dominion Forestry Branch made some enquiries to ascertain conditions and sentiments regarding a forest policy in the counties of the Trent watershed and neighbouring counties. This correspondence was placed at the disposal of the Commission, and the following extracts are reproduced to show that similar conditions prevail in the adjoining counties, and that, in general, the idea of a forest policy finds the general approval of those conversant with the conditions.

CARDIFF TOWNSHIP, HALIBURTON COUNTY.

There is probably 50% of the land in this township unfit for agriculture, being rough and rocky. This land has formerly been covered with pine timber and is now growing maple and beech, which, owing to distance from rail, are practically valueless. There is very little danger here from fire as the country is so cut up with lakes, etc., and, if reforested with valuable varieties, which would grow just as well as the present valueless ones, these lands would be a source of perpetual income, while now they offer no inducements to settlers. There will never be any more than a belt a few miles wide along the line of the Irondale, Bancroft and Ottawa railway successfully settled by farmers. The maple and beech cannot be taken out by water and cannot be worked profitably more than 5 miles from a railway. The result is that all lots are being stripped of everything valuable, and that locators then abandoned them outside this 5 miles ; and it will become increasingly difficult to reforest with more valuable varieties as time goes on.

MONMOUTH TOWNSHIP, HALIBURTON COUNTY.

Your letter of the 14th instant *re* non-agricultural land, township of Monmouth. The 1912 assessment roll is in the hands of the assessor at present, but as near as I can estimate from the 1911 roll, there is just about one-quarter of the township land in the hands of the Government, and this land is almost entirely unfit for agricultural purposes. And in my estimation, I think it would be a grand step for the Government to preserve the forest. It is a disgrace the way the settlers are destroying the forests, not only in this township but all over the north country. They think they are getting something for nothing. Lots of wood of their own to last their children's children, and yet they go into the Government land and slash away, taking only the good body wood and leaving a great slash to help on the forest fires.

Trusting you will be successful in your attempt to preserve the forest......

Marmora and Lake Townships, Hastings County.

In reply to your letter *re* non-agricultural lands in Marmora and Lake townships that could be re-forested, would say that at least one-half of Lake township could be re-forested, perhaps about 40,000 or 50,000 acres. There is considerable timber in Lake township yet. Only a small portion is used for agricultural purposes.

In regard to Marmora township, I would estimate that there are about 30,000 acres that could be re-forested.

Would think that it would be a grand thing to establish a forest reserve on those lands. Bush fires would be the greatest hindrance.

Hoping to hear from you at an early date to know if the matter is progressing favourably through the other parts of Canada.

Limerick Township, Hastings County.

You have asked me a hard question to answer. In the first place, this township is not a good farming township. A man who intends to do anything wants from three to five hundred acres, in order to work the best portion, and pasture the rough portions. There is about 50,000 acres of land in the township, about 17,000 assessed to residents. The balance is held by non-residents. I estimate that there are from ten to twelve thousand acres as good as what is settled on and would be settled if it could be bought. There are from ten to fifteen thousand acres that has been mostly a pinery. It is all stripped and left a slash and the fire has run over it until it is a barren looking place, so grown up with small red cherry, some poplar, and small undergrowth, that it is hard to get through it. Some places there is little pine. There was some land burned over when I first came in the township, forty-eight years ago. It has been mostly all cut over and is pretty much all a slash. I have watched the growth of the timber and it makes very slow progress. Some affords some wood but nothing of value. I am one of the oldest settlers and have been through the forest a good deal, and my opinion is that the second growth will never amount to much.

Chandos Township, Peterborough County.

Yours of the 22nd to hand and contents noted. The assessment of 1911 of the Township of Chandos, gives the total number of acres of waste land as 11,158 acres, while perhaps 25 per cent of this is drowned land, or too wet for forestry. The balance, or as much of it as possible, should, in my opinion, be administered for forest reserve purposes.

Harvey Township, Peterborough County

In reply to your letter, I would say that I judge there is twenty per cent of this township of Harvey unsuited for agricultural purposes, and that it would be a wise act to have the said twenty per cent reserved for forest purposes.

Harvey Township, Peterborough County

In answer to your letter of Jan. 17, I would like some more information in regard to what you would consider non-agricultural lands. There is a great deal of land in Harvey township not suitable for cultivation. In fact, I do not think that more than 20 per cent of Harvey is at present under cultivation. This includes about all that is suitable for cultivation, and some that is not suitable. On the other hand, there is a great deal of land used as pasture land, particularly round the lakes, and I do not know whether you would call this agricultural land or not. Kindly advise me on this point. In regard to establishing permanent forest reserves, I certainly think it would be advisable to have as much of the rough land growing timber as possible, but would like to know how you propose to acquire this land, in how large blocks, and what kind of timber, etc.

There are settlers living on land in Harvey who are not able to live on the land alone, but have to help make a living in some other way. Such land would certainly be better growing timber than anything else. A great deal of this pasture land I spoke of is merely slash land or, at best, is land that was settled on and, as long as the timber lasted, the settler made a living and perhaps grew a crop of wheat and one or two of hay, but, as it could not be cultivated, it soon became fit for nothing but pasture and the occupant was forced to go somewhere else. Then some farmer in Harvey or elsewhere bought the land and used it as a cattle pasture.

Minden Township, Victoria County

Yours *re* non-agricultural lands in this district to hand. In reply will say that a fair estimate of such land in my township would be from sixteen to eighteen square miles. When I make this estimate, I mean lands that are almost altogether useless for agriculture. While the greater portion of the township is settled and the majority of the lots are cleared, there are portions of nearly every lot of very little value for agriculture. If it could be made workable, I think the establishment of forest reserves a good scheme.

Township of Somerville, Victoria County

In reply to your favour of the 17th, I do not know that I can give you a very satisfactory reply. You ask me for an approximate estimate of the non-agricultural lands of the township. I should say that there are about sixteen thousand acres in this township unfit for agricultural purposes, some being portions of lots, the remainder of which are fairly good. Most of this poor land is fenced and is used for cattle runs (pasture). As to establishing forest reserves I am not in a position to give an opinion. Some of the poor land is in blocks of from one to two thousand acres, but a great deal of it is mixed between patches of fair to good land.

I have thought, when I see people (as some are doing) cutting young timber and selling it as cordwood, that it is a pity such practices could not be prevented, especially when it is young pine. I think, where a man has made a purchase of a government lot and paid one or two small payments, the sale should be cancelled if the land is growing up to young timber, especially if it is pine timber, even if the money he had paid were refunded to him. It might be all right to sell this waste land if it were sold under restrictions as to cutting young timber and the prevention of fires.

For Addington County, see Lennox and Addington.

For Durham County, see Northumberland and Durham.

FRONTENAC COUNTY

Please find below areas asked for in County of Frontenac. The woodland mentioned would be partly second growth, "swamp," partly timber growth and partly alders, "marsh" wild-hay, and wet land "rushes."

TOWNSHIPS.	Woodland Acres.	Slash Acres.	Swamp, Marsh, Wet Land Acres.
Barrie	7,498	2,406	10,888
Bedford	9,846	....	19,018
Clarendon and Miller	9,340	....	15,390
Hinchinbrook	864	....	44,156
Kennebec	8,140	....	19,767
Loughborough	10,382	....	2,753
Olden	5,788	....	18,586
Oso	16,341	....	6,898
Portland	7,696½	....	4,566
Palmerston and N. & S. Canonto	5,084	....	28,970
Storrington	1,322	....	25,593

Total area of County is 702,113 acres.

BANGOR, McCLURE AND WICKLOW TOWNSHIPS, HASTINGS COUNTY

Presented your letter of Feb. 3rd before Council of Bangor, *et al.* They authorized me to write stating that in their judgment 50 per cent of the township of Bangor, *et al*, is unfit for agricultural purposes and that it is well suited for a forest reserve, having been pine land, and now a large part of it is growing up with young pine.

HUNGERFORD TOWNSHIP, HASTINGS COUNTY

I would estimate the area of non-agricultural lands in this township at 10,000 acres. Personally, I think it a serious mistake that the matter of reforestry was not pushed along 15 or 25 years ago. Consider that permanent forest reserves would form an inestimable asset.

MAYO TOWNSHIP, HASTINGS COUNTY

In regard to amount of non-agricultural land in our township, there is about seventy-five per cent of it non-agricultural land, and I am of the opinion that the forest reserves would be all right here.

LANARK COUNTY

In the accompanying table you will find the acreages for the various sub-divisions of each township of the county. These figures were obtained from the township rolls for 1911. You will also find in the last column the estimated percentage of each township which is too rough and rocky to be used for agricultural purposes. These estimates were obtained from the clerk of each township. It would seem as if there is a good opening here for the establishment of forest reserves since there is so much land that is not now, and never will be, of agricultural value.

Lanark County

Township	Total Assessed Acreage	Acreage Cleared	Per Cent	Acreage Slash	Per Cent	Acreage Swamp Muck	Per Cent	Acreage Wood-land	Per Cent
Lavant	41953	3802	9.7	1467	3.5	....	....	36644	87.4
Darling	41657	10863	26.0	.....	....	2640	6.3	28154	67.5
Pakenham	57432	19991	34.8	3804	6.6	22622	39.5	11015	19.1
North Sherbrooke	16023	6838	42.6	352	2.1	1372	8.2	7515	46.8
Dalhousie	52702	23167	43.9	2903	5.5	5507	10.6	21025	39.8
Lanark	60297	28637	47.4	.....	....	12249	20.3	18510	34.0
Ramsay	61119	42486	69.5	1311	2.1	5296	8.6	11626	19.0
South Sherbrooke	35825	10123	28.2	375	1.0	1375	3.8	17951	50.1
Bathurst	61370	47865	77.9	490	0.8	1460	2.3	11555	18.8
Drummond	57688	32061	55.5	11349	19.6	6634	11.5	8088	14.0
Beckwith	57526	30418	52.9	4557	7.9	8622	14.9	13826	24.0
North Burgess	33565	15278	45.5	9709	28.3	3123	9.3	5209	15.6
North Elmsley	28600	19549	68.3	854	2.9	3565	12.4	4631	16.1
Montague	62535	32036	51.2	15278	24.4	7670	12.2	7551	12.0

NORTH BURGESS TOWNSHIP, LANARK COUNTY

The average agricultural land in North Burgess township from the Rideau lake to the concession VIII, would average about 15 per cent. Along the Rideau it would average much less as there is over 3,000 acres not settled on and only used as pasture land. Very large timber used to grow in this township, especially between Black lake and the Rideau. The fire in 1870 destroyed all growth of timber. I believe the land along the Rideau would be very suitable for establishing forest reserves.

DRUMMOND TOWNSHIP, LANARK COUNTY

Your letter *re* the establishing of permanent forest reserves on non-agricultural lands received, and in reply would say, that the non-agricultural lands in this district are principally marsh lands, that have been cleared either for farming purposes, or by bush fires, and are now producing nothing but weeds or scrub. Some of this land produced heavy timber, pine or tamarack. I might say that there is not any great amount of such lands, a few hundred acres in each place and not more than three or four places in the immediate district.

I am satisfied that, if these lands were reforested, they would not only be revenue-producing but be a benefit to the surrounding country.

NORTH ELMSLEY TOWNSHIP, LANARK COUNTY

In reply to your letter *re* the establishing of permanent forest reserves on non-agricultural lands in this section, I would say that there are several hundred acres of land in this township which have been partially drowned by the Tay canal and Rideau canal. On this land there were elm and ash swamps, which are now cut down and there is nothing growing in their place. Part of this, I suppose, is too low for any timber, while, on a large part, I should think that poplar might grow if once started, but through this section poplar is only growing on swamps that have been burned over, and these I mention are too wet to have any bush burned on them, although they are mostly clay bottom and deep soil. Any of the high land is good for grass, and I think that the owners would not care to have them planted with forest.

LAVANT TOWNSHIP, LANARK COUNTY

Re your enquiry of Jan.30th (file 33532) regarding non-agricultural lands in Lavant Township, I may say in reply that the assessment roll of 1911 gives the following—acres of woodland, 36,644 ; acres of slash, 1,467. The above figures will, I think, be a fair estimate of the non-agricultural land in this township.

Regarding my opinion as to establishing permanent forest reserves in this township, I may say that the bulk of this land has been burned over a number of times and I am safe in saying that as much of the original forest has been destroyed by fire as has been marketed. A portion of the east corner of the township lying furthest from the railway has, so far, escaped fire. I estimate it at about 3,000 acres, and it is fairly well timbered with original forest. The balance, where fire has passed over, is principally covered with a second growth of poplar, white birch and some white pine, but is swept by fire before it becomes fit for any use. If means could be taken to protect this from fire, a good supply of timber would be the result.

Ramsay Township, Lanark County

Replying to your favor of recent date, I might say that there is a large area of non-agricultural lands in this township, but I would judge that the greater part of these lands would not be suitable for reforesting.

I have 175 acres of land without a stick of wood on it—all good farm land and under cultivation. Would your Department supply me with young trees if I wished to devote a few acres to bush, and at what cost ?

Yonge and Escott Rear Townships, Leeds County

Replying to yours of recent date as to an estimate of the non-agricultural lands in Rear Yonge and Escott, would state that, in vicinity of Temperance and Charleston lakes, there are probably 1,000 acres of low and hilly (some rocky) lands, from which the timber has been mostly taken off. Some is now growing up to small timber, and I am of the opinion that these lands should be reserved for a future supply of timber.

Lennox and Addington Counties

Your letter of the 10th instant *re* non-agricultural lands in the county of Lennox and Addington duly received. We have three municipalities that contain a great deal of poor land which could be classed as non-agricultural, viz. :

1. Sheffield.
2. Kaladar, Anglesea and Effingham.
3. Denbigh, Abinger and Ashby.

Nearly one-half of Sheffield is non-agricultural, about four-fifths of Kaladar, Angelsea and Effingham and about four-fifths of Denbigh, Abinger and Ashby. If you wished I could write to the clerks of these municipalities and get further information for you, provided you let me know what further you required.

Denbigh, Abinger and Ashby Townships, Lennox and Addington County

The township of Denbigh contains about 50,000 acres, of which about 29,000 acres are either owned, located under the Free Grants and Homesteads Act, or otherwise occupied by private parties. Less than 20 per cent of this area is under actual cultivation. About 50 per cent is composed of rock, swamp or marsh land, not fit for cultivation.

All the land at all fit for agricultural purposes is now occupied and the remaining Crown Lands are unfit for settlement, and, as they are nearly all situate in the north western portion of the township they should, in my opinion, be included in a permanent forest reserve.

The township of Abinger contains about the same area as Denbigh, but contains a larger proportion of land unfit for agricultural purposes. It is also a part of this Free Grant District, and about 14,000 acres are occupied by settlers. The lands still belonging to the Crown are chiefly in the southern portion of the township and, together with similar lands in adjoining townships, form part of a forest reserve established by the Provincial Government.

The township of Ashby contains about a similar proportion of land fit for settlement and cultivation to the township of Abinger, but, as it does not belong to any Free Grant District, and the land has to be bought at fifty cents per acre, only about 4,000 acres are occupied. There is some good agricultural land in the centre and northern portions of the township, which would soon be taken up by settlers if they could get it as Free Grants, but as the areas are isolated and small, in comparison with the area of the surrounding non-agricultural lands, in my opinion it would be better not to encourage any more settlers to locate there, but to establish a permanent forest reserve of all Crown Lands within this municipality and adjoining townships ; to increase the precautions for the prevention of forest fires and to assist in reforesting these now unproductive areas, and thus provide a perpetual supply of timber for the future.

Kaladar, Anglesea and Effingham Townships, Lennox and Addington County

In answer to your enquiry of the 17th of January, I beg to say that there are about 22,077 acres of land not assessed in the townships of Kaladar and Anglesea, which would be mostly lands not fit for agricultural purposes, while the whole of Effingham is not assessed at all and would come under the same class of lands. It would be very desirable to have all that waste land re-forested, but would be a very hard task to accomplish as there are always bush fires, the source of which it is always impossible to ascertain, which destroy all the young growth of timber. For instance, three years ago a forest fire, of unknown origin, swept over all the lands mentioned and completely destroyed a fine young growth of timber, a great deal of which had already attained commercial value.

McLean and Ridout Townships, Muskoka District.

In reply to your circular letter of the 17th of January. In the united townships of McLean and Ridout, Muskoka district, the assessor returns 31,531 acres of woodland. Generally, the pine, hemlock and floatable timber have been taken off, leaving a scattered hardwood of poor quality, birch being the best. Where burned over, there is frequently a second growth of pine, which grows rapidly, but, unless attention is given to trimming and thinning out, it will not become of much commercial value as the tops spread out in many branches without any leading stem. I have several acres of such second growth, cleared about 40 years ago. Some years ago I trimmed a few, which have since grown more shaply. There is said to be 4,000 acres of slash land and 2,600 acres of waste or marsh land. The soil is a rather poor sand and not likely to give very good results from tree planting, unless well cultivated.

Oakley Township, Muskoka District

Yours of January 17th under file No. 33532 received. *Re* non-agricultural land in the township of Oakley, would say there is about 65 per cent of the land in this township unfit for agricultural purposes.

I believe anything that can be done to perpetuate the supply of timber in this section of the country, as in many others, would be desirable. Most of all, we deplore to see the pine timber being depleted. Twenty-five or thirty years ago, this township was well timbered with this species, which long since have been cut down and taken away, with the result that scarce a seedling can be found. True it is, many places are fairly well supplied with trees of the above species, ranging probably from fifteen to thirty years old, but where must a crop to follow these come from, without the adult tree to supply cones ?

I think it would be wise if some measure were adopted whereby at least one adult tree would be preserved on every hundred acres of land. This, with more strict enforcing of the laws relating to forest fires, would, in my opinion, be a great benefit to our country.

Northumberland and Durham Counties

I am in receipt of a communication from your office of the 1st instant, file number 33532, with regard to an estimate of the non-agricultural lands in the counties of Northumberland and Durham. I may say, that, so far as I can tell, there are about 40 square miles in Durham and about 25 square miles in Northumberland of non-agricultural lands.

With regard to the advisability of establishing forestry reserves on these lands, I consider it a most excellent thing, as these lands at the present time are of almost no use whatever, and we had thought of commencing some reforestation work in connection with this office, in the coming year.

Uxbridge Township, Ontario County

In reply to your enquiry of Dec. 1st, I beg to say that practically all of the non-agricultural land in this county is in the township of Uxbridge, and, so far as I can find out, the extent is about 2,000 acres. It would most certainly be in the interests of this section, to establish a permanent forest reserve. Not only its own value, but the value of adjoining lands would be materially enhanced.

Asphodel Township, Peterborough County

In the township of Aspodel, there is a steep gravelly ridge which runs from north-east to south-east across the whole township. It should never have been cleared, and would be far better reforested. Some evergreens brought from Guelph and planted last year appear to be doing well. There will be about 5 per cent of the township lands unfit for agriculture. It would certainly be wise to have these lands reforested, but the difficulty is that it is nearly all private property, and the trouble would be in protecting the young trees from cattle, especially with such trees as maple, basswood and such like, all of which grow well when protected.

Leeds and Lansdowne Front Township, Leeds County

I beg leave to report that I have examined the assessment returns made by the assessors for this municipality, and find that the number of acres given as slash or waste land is 3,897 acres. I believe those figures might be increased, as the acreage always overruns. I would consider it a wise act on the part of your department to establish permanent forest reserves on those lands.

ENNISMORE TOWNSHIP, PETERBOROUGH COUNTY

There are about 17,000 acres of land in the township of Ennismore and there is about one and a quarter to one per cent not fit for agricultural purposes. Reforesting approved of.

NORTH MONAGHAN TOWNSHIP, PETERBOROUGH COUNTY

Yours of December 22nd to hand, *re* file No. 33532. In reply to same I might say that I have consulted our reeve, Mr. W. G. Howden, and, in our opinion, there is not enough non-agricultural lands in North Monaghan worth bothering with for forest reserve purposes. If, on further enquiry into the same, I ascertain anything different I will immediately notify you.

OTONABEE TOWNSHIP, PETERBOROUGH COUNTY

In reply to yours *re* waste land in the township of Otonabee, there is about 10 per cent unfit for agricultural purposes. About four-fifths of the 10 per cent is composed of swamp land with much soil from one to eight feet in depth. The timber is principally tamarac and, as it is being depleted of timber, a young growth of tamarac is growing up. Also, part of the swamp area is flat rock along the margin of Indian river with soil a few inches in depth, the balance (one-fifth) is light sand land and small patches on steep hillsides. They are both found in small patches in many different parts of the township. Of course they should never have been cleared.

SMITH TOWNSHIP, PETERBOROUGH COUNTY

In reply to your enquiry *re* non-agricultural lands in Smith township (your file No. 33532), would say that there are about 600 acres of such lands in this township.

PRINCE EDWARD COUNTY

Replying to your letter of January 1st, file No. 33532, would say that in the county of Prince Edward there are some 15,000 acres of waste land. This is as I estimated it from reports I have obtained from the Clerks of the Townships and from the County Records. Of this amount, about 12,000 acres are marsh and swamp land, which in present conditions is no good for agriculture. It may be that in time this land could be drained and diked and thereby rendered useful, but it is a question. Then we have a tract of land in the township of Hallowell comprising about 600 acres, known as the 'Sand Banks' at Wellington. The sand is blowing and gradually covering up land. It is owned by the Provincial Government, although the farms which are being covered are owned privately. This land would make a very interesting study for reforestation.

Then, in each township, there is a considerable amount of slash land and shallow land which is not profitable for agriculture, and which in my opinion, would be suitable for reforestation. The amounts are estimated according to the following :

Ameliasburg	township	500 acres
Sophiasburg	"	200 "
Hillier	"	350 "
Athol	"	300 "
Hallowell	"	300 "

Together with the 600 acres included in the Sand Banks.

North	Marysburg township	150 acres
South	" "	200 "

The above is a fair estimate of the amount and extent of non-agricultural lands in this county.

You asked me to give my opinion as to the advisability of establishing permanent forest reserves on the non-agricultural lands here with the idea in view of establishing a perpetual supply of timber for the future. I must admit that I have not sufficient knowledge of the possibilities of reforestation to give an opinion that would be worth very much. At the same time I believe that it would be profitable to reforest a considerable amount of this land. At present it is used merely for rough pasturage, and it cannot be said that it is of very high value for this purpose.

Alice and Fraser Townships, Renfrew County

In reply to your letter of the 31st ult., I would say that west of lot 6, township of Fraser, the land is not fit for agricultural purposes. I may also state that this municipality is as far west as there are any lands that can be used for agriculture, with the exception of a small strip along the Ottawa river, in the townships of Petewawa, Wylie, Rolph, Head, Maria, and Clara. Take the townships of Master, Stratton, Bronson, Edgar, Barron, Guthrie, Clancey, Niven, White, Fitzgerald, and Algonquin Park, west of these townships. The land is not suited for agriculture. The chief thing is to preserve the natural growth of forest woods that are growing. The large pine is mostly cut out, but there is plenty of young growth if it can be preserved from fires.

Brudenell Township, Renfrew County

Your enquiry of the 31st ultimo to hand. I am pleased to see an interest awakened in the question of reforesting the non-agricultural areas of the country. This section of the country is eminently adapted for the growth of forest and is of little value, apparently, for anything else. Many of the farms are abandoned and growing up in second-growth. It has been all very heavily timbered before the axe of the lumberman and squatter and destructive forest fires came to lay waste the country's one important resource. If there is nothing done in the way of reforesting, it will not be for want of available land of the best kind.

Carlow Township, Renfrew County

Replying to your favor of the 3rd instant *re* forestry, I beg leave to advise you that there are no forest lands in the township of Carlow that would be worth forming into a reserve. There are, however, in this township about 20,000 acres of land that might be classified as non-agricultural lands. I do not think these lands could be successfully reforested as the soil is, generally speaking, of a rocky nature.

HAGARTY AND RICHARDS TOWNSHIPS, RENFREW COUNTY

Yours to hand *re* non-agricultural lands. In reply would say there is a portion of the township of Hagarty (northwest corner) that is not fit for agricultural purposes, although mostly taken up, principally for what timber is on it, and part of Richards. The Golden Lake Lumber Co. is at present engaged cutting timber in the latter township. In my opinion, if these lands were set aside there is enough young timber starting, that in a few years will be valuable, otherwise, if fire gets in, which usually occurs where there are settlers, it will destroy the young trees.

Will be willing in future to give any information within my knowledge.

RADCLIFFE TOWNSHIP, RENFREW COUNTY

There is any amount of land up here that would just suit this, but I could not give you an estimate of the number of acres. It would have to be travelled.

RAGLAN TOWNSHIP, RENFREW COUNTY

Yours of the 2nd instant to hand. In regard to your letter, I will give you my opinion on the matter ; there is a lot of land here not fit for agriculture, and, if it were efficiently protected from hunters and fishermen, so that we could keep it from getting burnt over again, this waste land would, in 25 or 30 years, be worth more than the farms with buildings, as in most places the pine is coming up again. The whole of this country is not fit for agriculture. If the Canadian Government establishes a forestry under the same plan as there is in Germany, I could give you very good advice on it as I have served that country for eight years in the Forestry Branch. The only and safest plan to protect the forest is to keep the people out of it, as there is plenty of good land in New Ontario where a farmer is able to make a living ; I cannot tell you how much exactly land is here for that purpose, but I am certain of half in Raglan, and there is one block of Radcliffe township about eight miles square which is not settled yet. If I could speak to you personally I could give you more information.

SEBASTOPOL TOWNSHIP, RENFREW COUNTY

In reply to adjoined circular I beg to state that in the township of Sebastopol are 9,312 acres of unoccupied Crown lands, which are probably quite unfit for agricultural purposes, and that of the 32,757 acres of occupied land probably one-half is unfit for agricultural purposes.

TOWNSHIPS OF WILBERFORCE AND NORTH ALGONA, RENFREW COUNTY

In reply to yours, No. 33532, I would say that it would be impossible for me to give an approximate estimate of the non-agricultural land in our townships. The fact is, I think the greater part of it should be classed as such. There is quite a lot of mountain land with little patches here and there between the hills and someone trying to grow something on it, but, if those mountains were reserved and protected from fire, I believe that, in a short time, they would be valuable. There is quite a growth of young trees, white and red pine, and many other kinds. There is quite a number of square miles of that sort of land, some of it

held by farmers living at some distance, who cut and haul their fire wood from it, but I think if it were reserved and properly handled it would soon be of great value. Young trees, up to the size of those which are on those mountains, grow very fast. I think I have given you about all the information I can in the matter, and wish you success in your undertaking..
....

I see by your reply to my report *re* waste lands, you have got an idea which I did not intend to convey. I said I considered the greater part of the land in this municipality was non-agricultural, but I did not say that the whole of it was covered with a growth of young trees. There is quite a lot of mountain land covered with trees, but the rest of it, although I consider it non-agricultural, is being farmed. Also the young trees growing on those mountains are not all red and white pine. It is mixed forest.

South Algona, Renfrew County

In reply to yours of January 31st, might say that in township of South Algona at an approximate estimate there would be about fifteen thousand acres of non-agricultural land therein, and I myself, have many times thought of your scheme of establishing permanent forest reserves. It would not only be a benefit for timber, but also be the means of causing the working class of Canada to be more industrious, and, if this means was once started, it would also be means of one part of Canada to try and compete with the other, and cause many more industries to spring up.

Carden Township, Victoria County

In reply to your communication of the 17th (*re* forestry), I beg leave to inform you that there are 38,256 acres of land in the township of Carden, returned by the Assessor in 1911, as swamp, marsh or waste land. The chief part of this land is used for grazing purposes. The limestone rock is near the surface. There are some portions of this land which I think it would be profitable to establish as forest reserves, but am not in a position to say which portion should be segregated.

Dalton Township, Victoria County

In reply to yours of January 17th, 1912, *re* non-agricultural lands, I may state that the number of acres is 25,000, which is well adapted for reforestation.

Fenelon Township, Victoria County

Your letter received. As you will notice in the Ontario Recapitulation returns, Fenelon is down for 9,640 acres of swamp, marsh, or waste land, 1,756 wood-land, and 7,600 odd acres slash land and about 32,000 cleared. Of course, some of the cleared land is not worth much, but it gives a certain amount of pasture as does some of the waste land, and I suppose farmers will not wish to sacrifice present returns, however small, for benefits to the country generally in the distant future.

I am not conversant with the plans of the Government to start forests, so am not able to give an opinion, but the waste land is very much scattered. Some odd hundred acres of the tamarac swamps are getting pretty well cleared, but I suppose they would, if let alone, grow up again.

Laxton, Digby and Longford Townships, Victoria County

In reply to yours of the 17th instant, which I enclose, would say that, according to the last revised assessment roll of the municipality of Laxton, Digby and Longford, there are 64,164 acres of non-agricultural lands in this municipality. Quite a large amount of this is barren rock and marsh, or beaver-meadow lands, so that I would not recommend establishing permanent forest reserves in any, unless it would be in the township of Longford. This particular township might warrant an inspection, as there are at present 38,872 acres of wood land, principally in this particular township.

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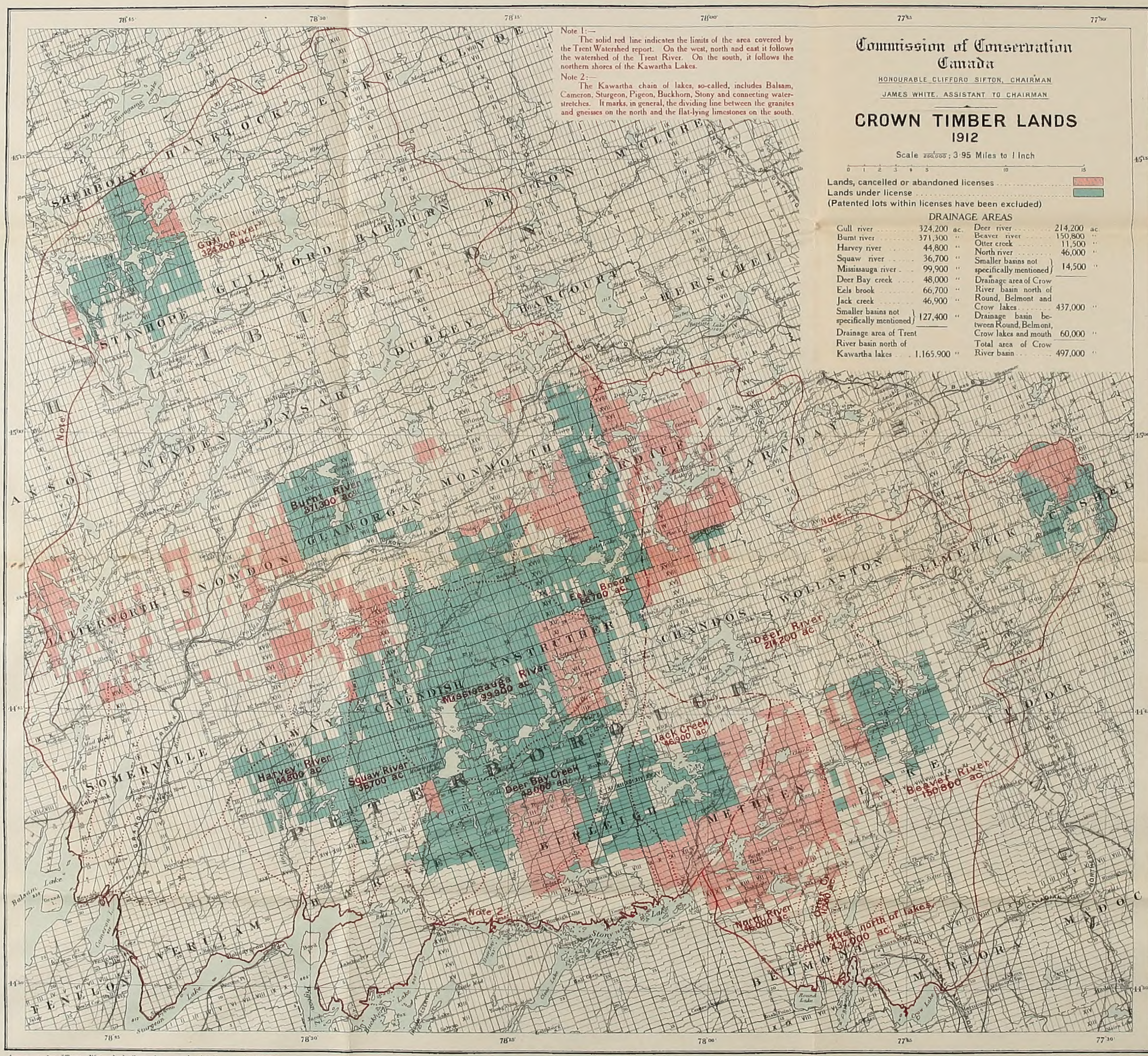
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CLYDE
McCLURE
BRUTON
HARBURN
GUILFORD
STANHOPE
HARCOURT
HERSCHEL
DUDLEY
DYSART
HALIBURTON
MINDEN
ANSON
MONMOUTH
CARDIFF
FARADAY
GLAMORGAN
SNOWDON
LUTTERWORTH
CASHEL
LIMERICK
WOLLASTON
CHANDOS
ANSTRUTHER
CAVENDISH
GALWAY
SOMERVILLE
PETERBOROUGH
BURLEIGH
METHUEN
HARVEY
LAKE
TUDOR
VERULAM
FENELON
BELMONT
MARMORA
MADOC
Gull River 324,200 ac
Burnt River 371,300 ac
Eels Brook 66,700 ac
Mississauga River 99,900 ac
Deer River 214,200 ac
Jack Creek 46,900 ac
Harvey River 44,800 ac
Squaw River 36,700 ac
Deer Bay Creek 48,000 ac
Beaver River 150,800 ac
North River 46,000 ac
Otter Cr. 11,500 ac
Crow River north of lakes 437,000 ac
Note 1
Note 2
Balsam Lake
Cameron L.
Sturgeon Lake
Stony Lake
Round Lake

Note 1:—

The solid red line indicates the limits of the area covered by the Trent Watershed report. On the west, north and east it follows the watershed of the Trent River. On the south, it follows the northern shores of the Kawartha Lakes.

Note 2:—

The Kawartha chain of lakes, so-called, includes Balsam, Cameron, Sturgeon, Pigeon, Buckhorn, Stony and connecting water-stretches. It marks, in general, the dividing line between the granites and gneisses on the north and the flat-lying limestones on the south.

Commission of Conservation
Canada

HONOURABLE CLIFFORD SIFTON, CHAIRMAN

JAMES WHITE, ASSISTANT TO CHAIRMAN

CROWN TIMBER LANDS
1912

Scale $\frac{1}{250,000}$: 3·95 Miles to 1 Inch

0 1 2 3 4 5 10 15

Lands, cancelled or abandoned licenses	🟥
Lands under license	🟩

(Patented lots within licenses have been excluded)

DRAINAGE AREAS

Gull river	324,200	ac.	Deer river	214,200	ac.
Burnt river	371,300	"	Beaver river	150,800	"
Harvey river	44,800	"	Otter creek	11,500	"
Squaw river	36,700	"	North river	46,000	"
Mississauga river	99,900	"	Smaller basins not specifically mentioned	14,500	"
Deer Bay creek	48,000	"	Drainage area of Crow River basin north of Round, Belmont and Crow lakes	437,000	"
Eels brook	66,700	"	Drainage basin between Round, Belmont, Crow lakes and mouth	60,000	"
Jack creek	46,900	"	Total area of Crow River basin	497,000	"
Smaller basins not specifically mentioned	127,400	"			
Drainage area of Trent River basin north of Kawartha lakes	1,165,900	"			

Accompanying "Trent Watershed Survey" report, by C. D. Howe and J. H. White.

Base map from plates of Dept. of Interior map